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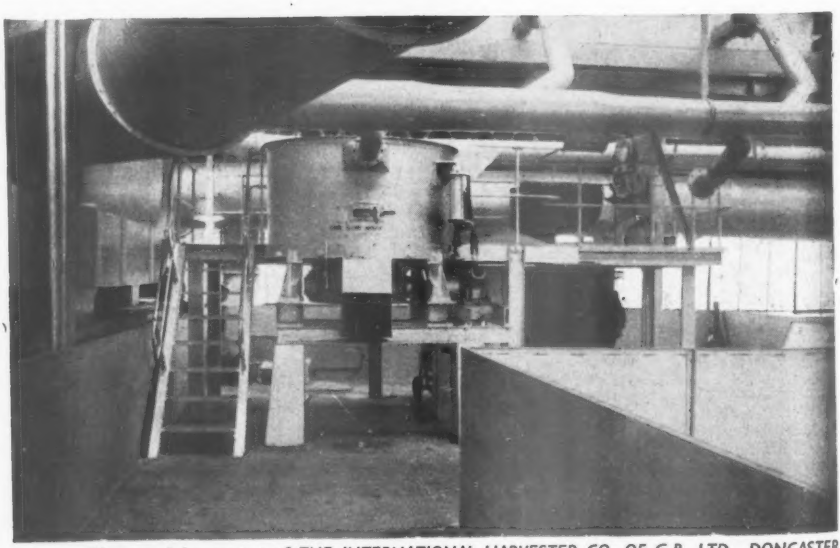

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Press Forged Castings and Shell Moulding

Only a few of the large number of papers to be presented at the forthcoming conference of the American Foundrymen's Society (Cleveland, May 19 to 23) have so far reached us. One of the most interesting is on "The Improvement of Castings by Press-forging." The castings referred to were two aluminium and one magnesium alloy. The authors, Mr. A. H. Murphy, Mr. L. L. Clark and Mr. W. Rostoker, have shown how relatively-small deformations applied either warm or cold, can substantially increase the tensile strength and yield points of this type of casting. This increase was within a range of from 25 to 70 per cent. with compressive deformations of from 10 to 30 per cent. It is suggested that by using low-cost dies, the cost of castings so treated should not be materially increased. As is usual with metallurgical developments giving higher tensile-strengths, the ductility suffers somewhat, but insufficiently so as to detract from its use as a foundry process in the case of the aluminium alloys, whilst for the magnesium alloy tested, there being but little inherent ductility, no measurable loss was noted. The authors conclude by stating here, "a potential process is available by which the cost and isotrophy of mechanical property characteristics of castings can be combined with properties approaching those of forgings."

A second paper which appealed to us was on the evaluation of shell-moulding process capacity. There are three joint authors, Mr. W. C. Truckenmiller, Mr. C. R. Baker and Mr. G. H. Bascom. Shell moulding has certainly provided engineers with castings of improved dimensional tolerances, but these have not always been constant. Variations in this country have been correlated to the position of the pattern on the plate and similar small details. These have been overcome by trial and error, but the obvious better method is by a statistical approach. We are aware that this has been done with good effect in the Midlands, but this paper clearly shows the advantages of such a research and to quote "examples of process capability studies of shell core-making equipment showed, as in the cases of casting dimension studies, not only present process capability but indicated numerical values for corrections to improve dimensional accuracy."

There is a second paper on shell moulding restricted to the case of pure-copper castings. It is by Mr. R. C. Harris, who reports that the decomposition products of the phenol-resins contain reducing gases which give rise to "steam reaction." This results in the severe embrittlement of the casting. The cure, after trials with lithium, titanium, phosphorus and calcium boride, was associated with the two first-named. It is further pointed out that either gas or high-frequency melting is preferable to furnaces showing strong stirring action and this action is liable to promote increased oxygen pick-up. This paper certainly enriches the literature of the casting of pure-copper castings which so far has been fairly meagre.

25th International Foundry Congress

As previously reported in the JOURNAL, the 25th International Foundry Congress is to be held in Belgium from Sunday, September 28, to Saturday, October 4. The overseas technical contributions have already been listed (JOURNAL, April 3, page 376) and the following details have now been received of the congress programme:—

Sunday, September 28: The congress office at Liège will be open from 2 to 7 p.m.

Monday, September 29: The opening session will take place in the Congress Hall, Brussels, and at approximately 12.30 p.m., there will be a reception in the Hall of Elegance. In the afternoon there will be a visit to the exhibition which is being held in conjunction with the congress.

Tuesday, September 30: Activities will be centred in the Congress Hall at Liège. A technical session will be held from 9 a.m. to 12 noon; at 10 a.m. there will be a meeting of the past-president's committee. After luncheon, the second technical session commences at 2 p.m. and continues until 4.30 p.m.; at 3 p.m. there is to be a meeting of the International Committee on Testing Cast Iron. The evening will be spent at a folk-lore party, commencing 8 p.m.

Wednesday, October 1: Visits to works and laboratories have been arranged. A meeting of the International Committee on Foundry Defects will take place at 10 a.m. in the Congress Hall, Liège, and at 2 p.m. there will be a meeting of the International Foundry Dictionary Committee. A concert is scheduled for the evening.

Thursday, October 2: Technical sessions will be held from 9 a.m. until 12 noon, and from 2 to 4.30 p.m., the closing session taking place at 5 p.m. Congress banquet at 8 p.m.

There will be more works visits on Friday, October 3, and a post-congress trip has been arranged to begin on Sunday, October 4.

A varied programme has been organized for the ladies which includes sightseeing tours. (Applications to attend the Congress should be made through the technical foundry associations of the participating countries.)

Euratom/US Nuclear-power Programme

A series of meetings has recently been concluded in Luxembourg, where representatives of the Commission of the European Atomic Energy Community (Euratom) and the Government of the United States discussed the means whereby a joint Euratom/United States nuclear-power programme might be developed. The objective would be to bring into operation by 1963 a number of large-scale nuclear-power plants to be built within the Community, primarily of the pressurized and boiling-water type, and having a total installed capacity of approximately one million kw of electricity. The group also examined the principal aspects of a supporting joint research and development programme which would be centred on these reactors. The programme would be designed to encourage maximum praticipation by the industries of the Community and of the United States. Substantial progress was made towards these objectives and further discussion of the proposed joint programme is planned to take place in Washington later this month.

Dinner

SILICA AND MOULDING SANDS ASSOCIATION

The annual dinner of the Silica and Moulding Sands Association was held on Wednesday, April 16, at the Savoy Hotel, London, when about 160 members and guests were present. Seated on the top table were: Mr. J. E. Roberts, Mr. P. H. Ogle-Skan (Ministry of Works), Mr. R. Hadfield, Mr. J. Blakiston, Mr. J. E. P. Moore (president of the Association), Mr. L. T. Sawney, M.C. (president, Glass Manufacturers' Federation), Mr. J. J. Breslin (Board of Trade), Mr. G. M. Menzies, and Mr. R. W. Orton. The Loyal Toast was proposed by Mr. Moore and Mr. J. Blakiston (president of the Institute of British Foundrymen) proposed the toast of the Silica and Moulding Sands Industry. Mr. Moore (of the United Glass Bottle Company, Limited) in his response mentioned particulars of the history of the Association and stated that it was derived from the National Sands Association, formed in April, 1932. Its activities took on a more serious nature at the outbreak of war in 1939, and the title was changed to its present one in 1941. Mr. E. Arnold was the first president and Mr. Halliday the first secretary—Mr. G. K. Timperley being his successor. The arrangements for the whole function went off remarkably well and thanks are due to Mr. Timperley for his splendid organization. During the course of the evening, members and guests were entertained by Miss Marjorie Wieland and Miss Peggy Cavell.

Industrial Safety Conference

The National Industrial Safety Conference is to be held in the Spa Theatre, Scarborough, from May 9 to 11, and this year the theme will be "Works Tidiness" in relation to industrial accidents. On the Saturday morning, May 10, Mr. J. B. Kitchin will present a paper on "Planning the Job for Safety," and Mr. George Hickling will deal with "Manual Handling and Lifting Methods." In the afternoon two more papers will be presented, the first by Mr. A. J. Goodall entitled "Moving Goods Safely about the Factory," and the second by Mr. J. McGuire on "Profitable Means of Access." On Sunday morning, Mr. H. H. Simmonds will read a paper on the "Safe Handling of Loads." The conference will conclude with a "Question Time" during which period written questions handed in by delegates will be dealt with by a panel of lecturers. Although the conference does not take place for several weeks, accommodation is already fully booked, and there has also been a heavy demand for space at the trade exhibition which is being held concurrently with the conference, in the Spa Restaurant.

Search for Original Inventions

A national competition has been launched by Freeman, Taylor Machines, Limited, textile and general engineers, of Syston, Leicester, with the purpose of discovering inventions which they can manufacture and market overseas. Preference will be given to inventions connected with engineering, though the company will be pleased to consider any suggestion other than the manufacture of articles concerning food and clothes. The guiding principles of the competition are that inventions submitted should be original and practical and that they should meet a universal need. The winner will receive a prize of 100 guineas and royalty, and royalties and cash awards will also be paid to runners-up whose inventions are acceptable. Further details of the competition can be obtained by writing to the company at the address quoted.

Recent Developments in the Field of Malleable Cast Iron

By K. Roesch

In the following abstract the author discusses suitable conditions for the production of malleable cast iron, referring in particular to the influence on structure and mechanical properties of improved melting techniques, heat-treatment and greater knowledge of chemical composition. Considerable attention is paid to annealing in decarburizing and neutral gases for whiteheart and blackheart malleable iron respectively and the effect of these processes on physical properties is described.

The steadily increasing demand for malleable iron, especially by the motor-car industry, and the necessity of competing against forged and welded parts on economic and material-quality lines, have made it necessary to improve the quality, and particularly the uniformity, of whiteheart and blackheart malleable iron.

Recent developments brought about by these requirements are characterized by:—

(1) Improvements in melting. (2) Increased knowledge of the influence of the ratio of sulphur to manganese and of silicon to sulphur, and also the influence of chromium and some trace elements on the properties. (3) Annealing in decarburizing gases (for whiteheart malleable iron) or neutral gases (for blackheart malleable iron) thus making use of newly-developed furnaces. Each of these improvements will now be considered in greater detail.

Melting

Use of the hot-blast cupola for melting whiteheart malleable iron and of mains-frequency electric furnaces for blackheart malleable iron has shown that by increasing the melting temperature loss of silicon can practically be avoided[1]. American investigations[2] have shown that by doing so the number of graphite nuclei is increased and that the temper carbon is therefore segregated in finely-divided form during the annealing process[3]. This has a favourable, if limited, influence on the mechanical properties.

By melting in the hot-blast cupola, the metallurgical conditions are improved as is shown by the lower iron-oxide content of the acid slag, which is found to be between 0.8 per cent. and 1.5 per cent.[4] In order to keep the conditions in the melting zone constant, particularly where the reduction of silicon from the furnace linings is concerned, recently-developed plant has been changed so as to give automatic-controlled temperature in the combustion chamber of the blast-heater and thus control of the temperature of the blast. By increasing the blast temperature above 400 deg. C. the loss of silicon becomes negligible. The introduction of the acid-lined mains-frequency electric furnace for blackheart malleable iron has made it possible to melt under improved metallurgical conditions and to maintain the most favourable composition in the same way as it is maintained for whiteheart malleable iron[5].

Chemical Composition and Structure

It is a fundamental condition, both for whiteheart and blackheart malleable iron, that the sum of carbon and silicon contents must not exceed 3.8 to 3.9 per cent. in order to prevent—in the case of thicker sections of one inch and more—the segregation of graphite in unfavourable lamellar structure during the cooling in the sand mould. Graphite should only form during the ensuing annealing and only then in the most compact form. The flocculated spherical shape in which the temper carbon segregates is one of the main conditions contributing to the good ductility of this material.

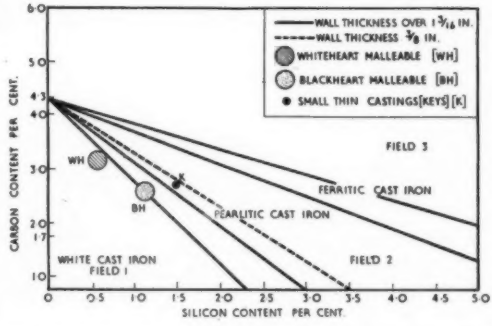

FIG. 1.—*Cast iron diagram by E. Maurer, amended by F. Roll.*

The composition "as cast" for whiteheart and blackheart malleable iron can be seen from the diagram by Maurer[6] and in its amended form by Roll (see Fig. 1). The diagram indicates that the carbon-content for whiteheart malleable may exceed 3 per cent. C., so that melting in the cupola becomes a practical proposition. The carbon-content for blackheart malleable iron which is annealed in a neutral-gas atmosphere must be below this figure in order not to impair the mechanical properties by an excess of segregated temper carbon. For this reason the carbon content for

* Abstracted from report No. 1107 of the materials sub-committee of the "Verein Deutscher Eisenhüttenleute," by Dr. O. P. Einerl. See also: *Stahl und Eisen*, 77, (1957), pp. 1747/51.

Recent Developments in Malleable Iron

blackheart malleable iron should be between 2.5 and 2.8 per cent. Malleable iron used for the production of very thin small parts such as keys may contain higher silicon contents so that the sum of carbon plus silicon exceeds 3.9 per cent., because the rapid cooling would in any case produce a white structure.

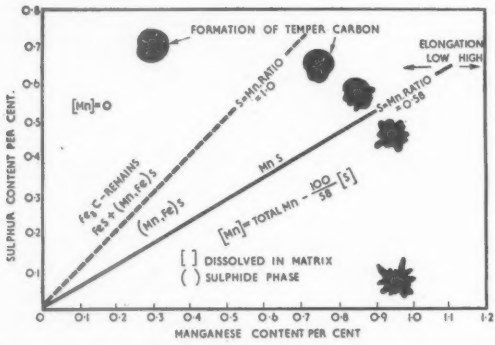

FIG. 2.—*Influence of the sulphur:manganese ratio on the structure and elongation of annealed whiteheart malleable with* 0.4 *to* 0.7 *per cent. Si and under* 0.08 *per cent. P.*

Sulphur : Manganese Ratio

The sulphur : manganese ratio is of particular importance for the graphitization during annealing. Considered individually, the influences of sulphur and manganese do not present a correct picture. Sulphur has the function of an alloying element for whiteheart malleable iron in order to obtain a clean, smooth thread when cutting screw threads into thin-walled strongly-decarburized parts; in such cases the sulphur content should be about 0.22-0.25 per cent. But the ratio of sulphur to manganese has a noticeable influence on the structure, on the shape of the segregated temper carbon and on the mechanical properties. Fig. 2 shows the influence of the sulphur : manganese ratio on the matrix, the shape of formation of the temper carbon and on the elongation of whiteheart malleable iron after decarburizing annealing.

If the ratio sulphur : manganese is smaller than 0.58, that is to say, when all sulphur is chemically bound by manganese (on the right of the line Mn S in Fig. 2) then all sulphur is present as manganese sulphide only, because the heat of reaction, when sulphur combines with manganese, is twice as high as that which would result from the reaction of sulphur with iron. Any excess of manganese is dissolved in the ferrite.

If, on the other hand, the ratio is greater than 0.58, that is, when there is more sulphur than can be chemically bound by the manganese present (left of the line Mn S in Fig. 2), then the excess sulphur will be bound by iron and mixed crystals (mn, Fe) S will be seen under the microscope and can be recognized by their colour in the structure of the iron.

On cooling, separation in the direction of Fe S will occur.[8] If the sulphur : manganese ratio increases further and exceeds the value of 1.1 (see on the left of Fig. 2) then pure iron-sulphide will appear in addition to the mixed crystals (Mn, Fe)S. In this case the temper carbon will segregate in more or less well-shaped spheroids similar to those found in spheroidal-graphite cast iron. The ferritic matrix does not contain any manganese as this is completely bound to sulphur as Mn S. A high proportion of iron sulphides stabilizes the cementite, therefore the graphitization is made more difficult, so that remains of cementite will be found despite prolonged annealing at 1,050 deg. C. for 60 to 90 hours. Fig. 2, therefore, shows (on the left) cementite Fe_3C as a structural component when iron-sulphide is present.

The border line for white solidification (as shown is Fig. 1, field 1) will, with sulphur contents rising, move to higher silicon contents, a fact which also applies to ordinary cast iron. The maximum of graphitization will occur when the sulphur : manganese ratio is lightly below 0.58, that is with

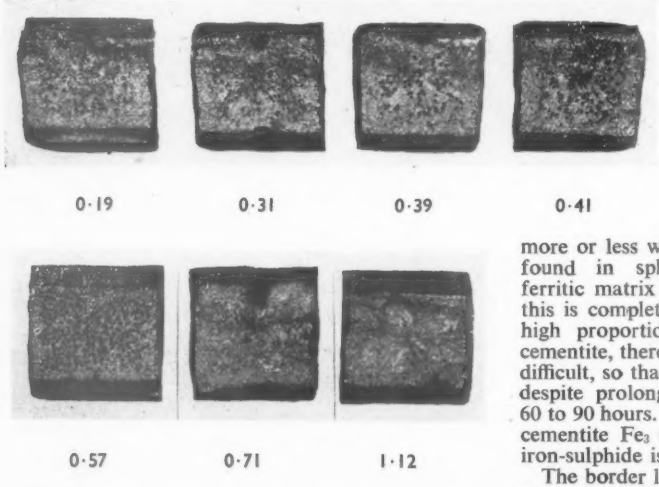

FIG. 3.—*Influence of the sulphur:manganese ratio on the graphitization in the annealing of whiteheart malleable iron (slight reduction, in photographing, of size of original specimens).*

the higher manganese contents (on the right of Fig. 2). This is valid both for whiteheart and blackheart malleable iron on annealing.

Fig. 3 shows the influence of the sulphur: manganese ratio on the graphitization when whiteheart malleable iron is annealed. The most favourable condition exists at, or just below the 0.58 ratio line.

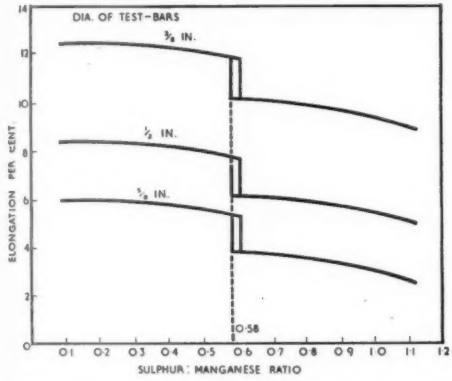

FIG. 4.—*Influence of the sulphur:manganese ratio on the elongation of annealed whiteheart malleable iron.*

The last photograph in the second row shows clearly the influence on the structure when iron-sulphide appears. Despite annealing at 1,050 deg. C. for 40 hours, the structure still contains much cementite in addition to very little spheroidal temper carbon.

The tensile strength of whiteheart malleable iron increases when the sulphur: manganese ratio falls below 0.58 (on the right of Fig. 2) and elongation increases remarkably. This is evident from the paper by Palmer[9] as well as from the author's own investigations (Fig. 4). It can be explained by pointing out that in the case of excess manganese (ratio below 0.58) the manganese dissolved in the ferrite will have a beneficial effect. The grain-boundary constituents and their shape will also have an influence on the elongation, depending on whether manganese-sulphide with high melting point or (Mn, Fe)S with low melting point is present. As will be shown later, a further increase of free manganese content will still considerably improve the mechanical properties, especially the elongation, but at the expense of a more difficult decomposition of the cementite.

It should be mentioned that chromium is a most undesirable element introduced by the large amounts of scrap used in the production of malleable iron. Chromium has the stabilizing effect of a carbide former both for whiteheart and blackheart malleable iron and even small chromium contents above 0.15 per cent. render the graphitization difficult in both productions.[7] A regular check of the chromium content by spectrographic methods is therefore advisable. A simple spectroscope with visual observation is sufficient for this purpose. Chromium contents in malleable iron become noticeable especially in cases where larger wall thicknesses cannot be decarburized. The consequences of a higher chromium content will be remains of cementite which make the machining difficult. Chromium up to 2 per cent. has no influence on the decarburization of thin-walled whiteheart malleable castings, for instance fittings below $\frac{5}{16}$ in.[10] The unfavourable influence of small chromium contents can, to some extent, be balanced —for both kinds of malleable iron—by adding small amounts of ferroboron. Additions of 0.003 per cent. are sufficient; higher additions impede the graphitization.

Heat-treatment

Fig. 5 shows schematically the annealing curves for both types of malleable iron in modern gas annealing furnaces. The annealing of blackheart malleable has to be done in two stages and the double-chamber furnace as well as the hood-type annealing furnace have been found to be most suitable for this purpose. These air-tight sealed furnaces make it possible to observe the two annealing stages without risk of surface decarburization, in order to obtain the required structure of ferrite and temper carbon. During the first stage, graph-

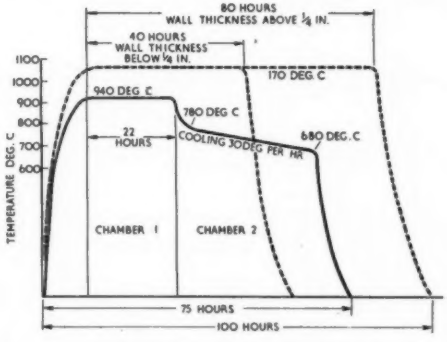

FIG. 5.—*Temperature diagram for the heat-treatment of blackheart and whiteheart malleable iron in modern gas-annealing furnaces.*

itization takes place as a result of disintegration of iron carbide in the ledeburite into temper carbon and gamma-mixed crystals. The second stage, the "ferrite-annealing," takes place during slow cooling at the rate of 3-4 deg. per hour when the gamma-mixed crystals decompose into ferrite and temper carbon. Altogether about 50-60 hours are necessary for the completion of this annealing process which is nearly independent of the wall-thickness of the casting.

The introduction of gas-annealing for whiteheart malleable iron has been very successful. Tunnel furnaces, indirectly heated by radiant tubes, are being used for decarburization at 1,050 to 1,070 deg. C. in a gas mixture, the composition of which

lies near the border line between reduction and oxidation of iron. The gas is so composed that it is in equilibrium with an iron which contains only traces of carbon, it consists of CO 27-30 per cent., CO_2 8-10 per cent., H_2 24-26 per cent., water vapour 16-19 per cent., the balance being nitrogen. It is possible to decarburize thin-cast parts with 3-3.2 per cent. C to less than 0.1 per cent. C. without scaling.

As this gas mixture does not produce scaling at 1,050-1,070 deg. C., the perforated annealing boxes can be made from unalloyed sheet metal. Because of the high hydrogen content and the high working temperature, and also the abolition of ore packing and heavy annealing boxes, the decarburization of thin castings can now be carried out in 50 hours. (including heating and cooling) instead of 100 hours as was the case in the old chamber furnaces. Fig. 6 shows the view of modern tunnel furnaces.

According to Palmer[13] an addition of hydrogen to the annealing gas delays the graphitization, but an enrichment with H_2 O/H_2—compared with a mere CO/CO_2 mixture—improves the decarburization. In Fig. 7 information is given about the mechanical properties now attainable with both types of malleable iron. The high elongation figures shown for whiteheart malleable castings with thin sections of $\frac{3}{8}$ in. or less, indicate the main applications of this material. A second annealing at 750 deg. C. for thicker parts of whiteheart malleable iron has been found to be successful for converting lamellar pearlite into grained cementite. This increases the elongation and improves the machinability.

Blackheart malleable iron, because of its increased silicon content, will always have a completely ferritic matrix after annealing, even in thick sections. Blackheart is therefore the recommended material for thick, large castings when ease of machinability is the first consideration. For parts which are exposed to wear, for brake drums, the cooling during the second stage must be arranged in such a way that a high proportion of pearlite is present in the structure.

For some years now, a malleable cast iron with good weldability has found various uses in the motor-car and motor-cycle industries. This malleable iron has a very low silicon content of 0.35 per cent. Si or even less, a manganese content of about 0.8 per cent. Mn and a sulphur content below 0.08 per cent. S. The sulphur : manganese ratio is therefore about 0.1 per cent. Decarburization is carried out very thoroughly so that castings with $\frac{3}{8}$-in. wall-thickness will show an almost ferritic structure without any temper carbon. The mechanical properties of weldable malleable iron are described in Table I.

Dia. of testbar.	Yield point, tons/in.²	Tensile strength, tons/in.²	Elongation, per cent.
$\frac{3}{8}$ in.	11– 15	21.5–25	34–36
$\frac{1}{2}$ in.	12.5–16.5	23–26.5	25–17

Summary

Improved knowledge of the conditions of melting and heat-treatment of blackheart and whiteheart malleable iron has brought about important improvements in mechanical properties. The introduction of the hot-blast cupola for the production of whiteheart malleable iron and the use of the mains-frequency furnace for the melting of blackheart malleable iron have made it possible to maintain more uniform and more favourable working conditions. This has a good effect on the subsequent annealing in neutral or mildly-oxidizing gas atmospheres, carried out in modern tunnel furnaces and satisfactory structures together with good mechanical properties are obtained. It has been found that the sum of carbon plus silicon must not exceed about 3.9 per cent. for both types of malleable iron and that the sulphur : manganese ratio—especially in the case of white malleable iron—influences the formation of the temper carbon, the speed of graphitization and the composition of the matrix. The most favourable conditions for graphitization exist when the value of the sulphur : manganese ratio is below 0.58 per cent., in which case the elongation increases considerably.

The carbide-stabilizing effect of chromium contents exceed-

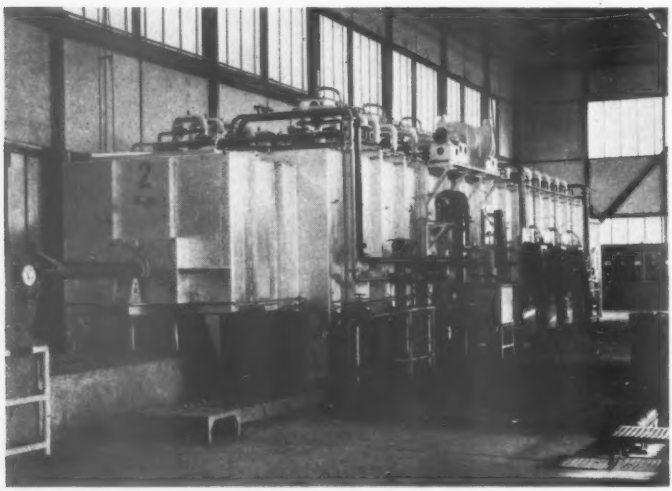

FIG. 6.—*Modern tunnel furnace for gas-annealing of whiteheart malleable iron.*

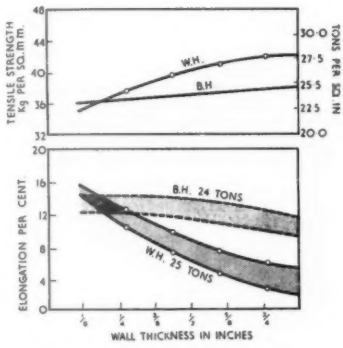

FIG. 7.—*Graphs showing mechanical properties now attainable for whiteheart and blackheart malleable iron.*

ing 0.15 per cent. which can be observed in both types of malleable iron can partly be balanced by small additions of ferroboron (about 0.003 per cent.).

Modern furnaces, with controlled compositions of the annealing gases and correctly-controlled temperatures, create the best conditions for the annealing of blackheart malleable iron in two stages and for the decarburization of whiteheart malleable iron. The composition of a gas mixture which does not cause scaling at annealing temperatures of 1,050-1,070 deg. C. has been given. Thick-walled parts can either be made from whiteheart malleable iron, in which case a second annealing at 750 deg. C. is recommended, or from blackheart malleable iron. By controlling the conditions of the cooling process, castings with good resistance can be produced, having a large portion of pearlite in their structure.

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British Standards Institution

B.S.M.27:1958 *Non-fluorescent magnetic flaw-detection inks for finished machined aircraft parts.*

A new standard (B.S.M.27:1958) specifies the requirements necessary for inks suitable for use on aircraft parts for which magnetic flaw detection is a design requirement. It defines the composition of the ink and specifies the materials to be used in its manufacture. There are requirements for inspection of the ink ("type approval" and "routine inspection") and for its marking. Tests deal with "Determination of solid content," "Functioning" and "Corrosion." Copies of this standard are obtainable from British Standards House, 2, Park Street, London, W.1, price 4s.

C. A. Parsons' Activities in 1957

Reporting on orders for work put in hand during 1957, C. A. Parsons & Company, Limited, Newcastle-on-Tyne, point out that two turbo-generators of 300 MW output were ordered by the Hyro-electric Power Commission of Ontario. They are claimed to be the largest machines ever bought by a Canadian utility undertaking and the largest to be built in Britain. These sets will be of the cross-compound type, and will take steam at 2,350 lb. per sq. in. pressure, 1,000 deg. F. and reheat to 1,000 deg. F. In addition the Commission has ordered a fourth 200-mw set for Toronto.

A second 200-mw turbo-generator was ordered by the Central Electricity Authority for the West Thurrock power station, and orders were received for machines of 120 mw output, there being now a total of 13 machines of this size on order and under construction. Three turbo-alternators of 100 mw output have been ordered for the Aberthaw power station, making six machines of this output for this station. In addition a number of machines for outputs of 30, 25, and 20 mw output have been ordered for export to South Africa, Canada and Mexico.

Believed to be the largest in the world, a large turbo-blower was put into service at the beginning of 1957 at the steel works of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited), Scunthorpe. It delivers 160,000 cub. ft. of free air per min. at a pressure of 35 lb. per sq. in. and is designed for split-wind blowing, supplying additional air to four separate furnace mains individually supplied by four existing tubro-blowers.

Parsons have now installed or have on order 740 mw of turbo-generating plant for nuclear power stations, and a large number of orders were received during the year for generator, transmission, distribution and mining type transformers.

Shipyard Expenditure Showing Results

Expenditure on modernization of the shipyards and engine works of Swan, Hunter, & Wigham Richardson, Limited, has now reached a stage where it is beginning to show results in increased productive efficiency, states the chairman, Mr. E. J. Hunter, in his annual review. Value of work in progress totalled £16,565,080 (£13,801,262) at the end of December, and there is a substantial volume of work on hand and on order, though present low freight rates have caused some decline recently in the demands on shiprepairing facilities.

The 1957 group net profit was £1,595,996 (£1,622,987) and the dividend is raised by 4 per cent, to 18 per cent., the final being on the ordinary capital increased by 369,774 shares issued for the minority interest in the Wallsend Slipway & Engineering Company, Limited.

United Steel's First-aid Competitions

At the annual first-aid competitions held for branches of the United Steel Companies, Limited, Sheffield, at Scunthorpe recently, the team from Appleby-Frodingham won with 215 points, four more than Steel, Peech & Tozer's team. Last year's winners, the Cumberland group, from Workington, was third.

Judging the competition, Dr. H. Jackson said that all teams had given a satisfactory display and could regard themselves as key workers in any first-aid undertaking. Lt.-Cmndr. G. W. Wells, managing director (engineering) of the United Steel Companies, presented the cup.

American Letter

Trade with Canada

Adjustments in trade relations between Canada and the USA are predicted now that Premier John Diefenbaker's conservatives are firmly entrenched after their overwhelming victory involving 210 seats of the 265-seat parliament. The Conservative majority gives them the largest single-party representation in Canada's history. The new premier is said to be a determined spokesman for the strong element in Canada which, while being aware of the need for friendship between the two countries, deplores the growing Canadian dependence on the USA in the economic field. Mr. Diefenbaker, during a recent campaign, argued that in order to reduce Canada's adverse trade balance with the USA some 15 per cent. of her annual trade with the latter should be diverted to Great Britain.

Economic Situation

The prevailing sag in US business activity is still regarded as a corrective influence. The word "recession" is considered a proper one to use in this connection. An American business writer defines recession as a refusal or resistance to buy, whilst depression is regarded as an inability to buy. Spending for necessities has subsided and inventories both industrial and domestic continue to be worked down while spending for services and certain luxury items and activities holds up. These are presented as arguments in support of the recession label.

In this economic climate the metal industries are still engaged in adjustments to activate their markets. The two cent* per lb. reduction in the price of aluminium ingot cancels a one cent per lb. rise made some time ago and sets a new low for the prevailing period. A one cent per lb. reduction in the price of lead to 12 cents sets this product at the lowest level since April of 1953. Steel scrap prices falling to a level of about £12 10s. a ton represents another slow adjustment to prices in the metal market.

Throughout the recession inflexible labour rates in a soft market continue to shrink the labour input to a reduced volume. The metal industry then operates only its most efficient installations and unemployment is created or part-time employment results. In any case, labour income takes its cut along with the reduction in business volume until stabilization is achieved.

Ford Motor Company announced plans to sell six models of its "compact" German-made Taunus passenger car in the United States. The models being imported include two- and four-door sedans and station wagons, all of which are available in standard and de luxe models. Addition of the new line gives the company a 20-car range of foreign vehicles in this country. The English Ford line of 14 models will continue to be imported into the United States along with the Taunus. In bringing the second foreign make, Ford is now level with General Motors Corporation which is importing its German-made Opels and English-made Vauxhalls. The new Taunus models were shown publicly for the first time at the International Automobile Show at the New York Coliseum on April 5.

Automobile Markets

Foreign-built cars took approximately 3½ per cent. of the total US market last year. The total moved sharply upward in December and January, nearing the 5 per cent. mark. Any competition that takes up to 5 per cent. of the market is obviously deserving of serious consideration. American car manufacturers are now giving the foreign car "invasion" a thorough study. Imported units last year accounted for about 212,000 retail sales. The planning for production of a small, lower-priced car took shape when sales of similar foreign-built cars began to soar. By percentage they continue to mount, but the overall car market in 1958 is not likely to be as broad as it was in 1957. Total retail sales of imported vehicles may fall short of the predicted total of more than 300,000 units.

Automobile News

The industry upon which so much of the American economy depends is passing through a trying period. Sales helped by a pent-up demand reached a record level of 8,000,000 cars in 1955, then dropped to about 6,000,000 in 1956 and a corresponding 6,000,000 car rate continued for 1957. Estimates for 1958 were built on a 5,300,000 output which had been cut to 4,700,000 and is now predicted at 4,500,000. Over the four years the averages would settle at about a 6,000,000 car rate. Prospects for the anticipated reduction in production are stimulated by an inventory of about 1,000,000 unsold cars in the hands of dealers.

Burnham Finney, editor of *American Machinist*, predicts that the automobile industry's three major producers soon will be producing small cars to compete with foreign makers. He said the Chevrolet division has bids out for small-car dies and tools and he expects Ford and Chrysler to follow. In a talk at Detroit, Mr. Finney said the trend toward bigger and more powerful cars has tended to price US cars out of the market. An additional production of 1,000,000 vehicles in terms of coaches and lorries with a much lesser deviation in annual output should be added to the total of private vehicles above.

Metal Market

Production of metals has been trimmed so as to fit with existing demands. The stockpiling by the government and the accompanying build-up of inventories has abated and led to necessary adjustments. By the end of March steel production declined to its lowest level in six years at about 50 per cent. of capacity-operating rate. This amounts to about 1,210,400 long tons weekly against 1,312,750 tons a month ago and 2,103,960 tons a year ago. The production of other metals has been reduced to a lesser extent. Copper production has been cut back 10 per cent. to 15 per cent., nickel 10 per cent. aluminium 20 per cent. to 25 per cent. These cutbacks, along with a reduction in existing inventories, are expected to restore stability to the movement of metals. The headlong production of goods may be fitted to a more leisurely pace and the raw metals necessary to manufacture has been trimmed to fit a more sensitive demand. The metal markets are acquiring an orderly readjustment and the corresponding stabilization may lead the way to a recovery toward normalcy.

Canadian Unemployment

Unemployment is reported to have reached 10 per cent. of the available labour supply of which number 555,000 are unemployed while 36,000 additional are on temporary lay-offs. The total labour force is set at about 5,870,000. These statistics do not include working time lost through a reduction in the number of hours worked weekly with which a substantial portion of the labour force is confronted. The increase in number of unemployed since a year ago is approximately 72 per cent.

* One cent (USA) = approximately 0·353d.

MBC Performance

UK HOT-BLAST CUPOLA OPERATING EXPERIENCE

Described by A. R. Parkes

It is now several years since the Metallurgical Blast Cupola (shortened to MBC) was developed by Mr. Robert Doat, of the Conduites d'Eau concern of Liège in Belgium. Its design and operation postulated some novel conceptions of cupola practice which in theory appeared to be based on very sound metallurgical principles and several accounts were published concerning the design and performance to be expected. Following these, what every foundryman wanted to have was a first-hand report from a UK founder who had installed such a plant and operated it for a sufficient length of time for the economics to become apparent or any snags revealed. This is now possible and the account which follows has been made available exclusively to the* FOUNDRY TRADE JOURNAL.

When stress is laid in this account of the performance of the MBC hot-blast cupola on the fact that UK operation is referred to, no reflection is made on the reliability of accounts emanating from overseas; it is just that UK melting conditions—quality and availability of coke, economics of patching material, refractories, etc.—all vary according to country and sometimes even according to locality within a country. Thus a furnace which is an economical proposition in one country where perhaps only poor-grade foundry coke is produced, may not offer the same advantages where (normally) good, low-ash coke is freely available. The writer believes that sometimes the quoting of operating details for plant out of context, as it were, and without information about materials and supplies available on site can be very misleading, and not a few founders in recent years have sorry experiences to relate because of this.

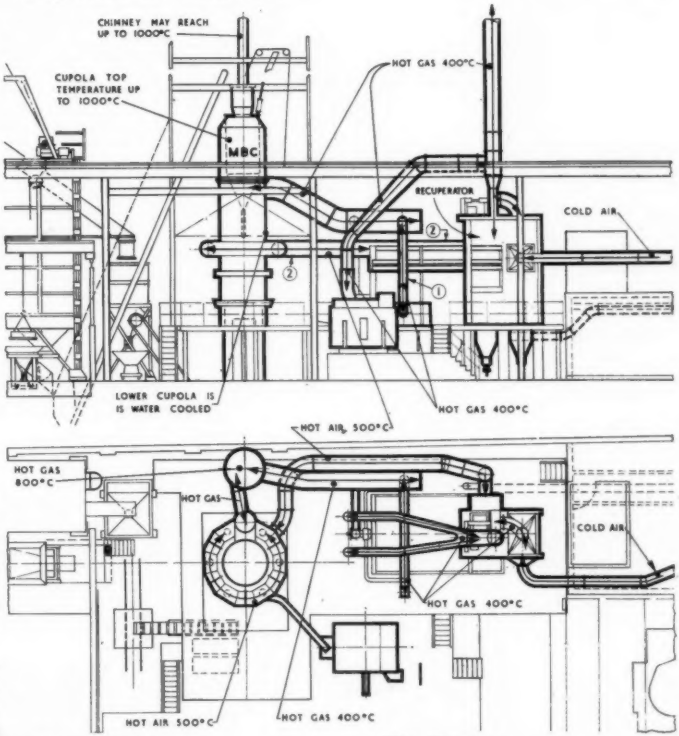


FIG. 1.—*Plan and side elevation of the MBC installation, and its auxiliaries, at a foundry in the United Kingdom.*

With this preamble very much in mind, every effort will be made to give a fair picture of the site conditions, objectives sought, operational restrictions, and so on, pertaining to the MBC installation installed at a well-known foundry in this country. To avoid the embarrassment caused by over many requests to see the plant, the firm making the information available has asked to remain anonymous but correspondence (through the Editor of the JOURNAL) is welcomed.

The Furnace

In that the Metallurgical Blast Furnace is a vertical-shaft furnace, refractory lined, it is like any other cupola, but the comparison does not go much further. The principal features of the MBC

* "Metallurgical Blast Cupola," JOURNAL (August 31, 1950), **89**, 227, 229; and "Metallurgical Studies of the MBC and ADS Cupolas," JOURNAL (December 1, 1955), **99**, 629.

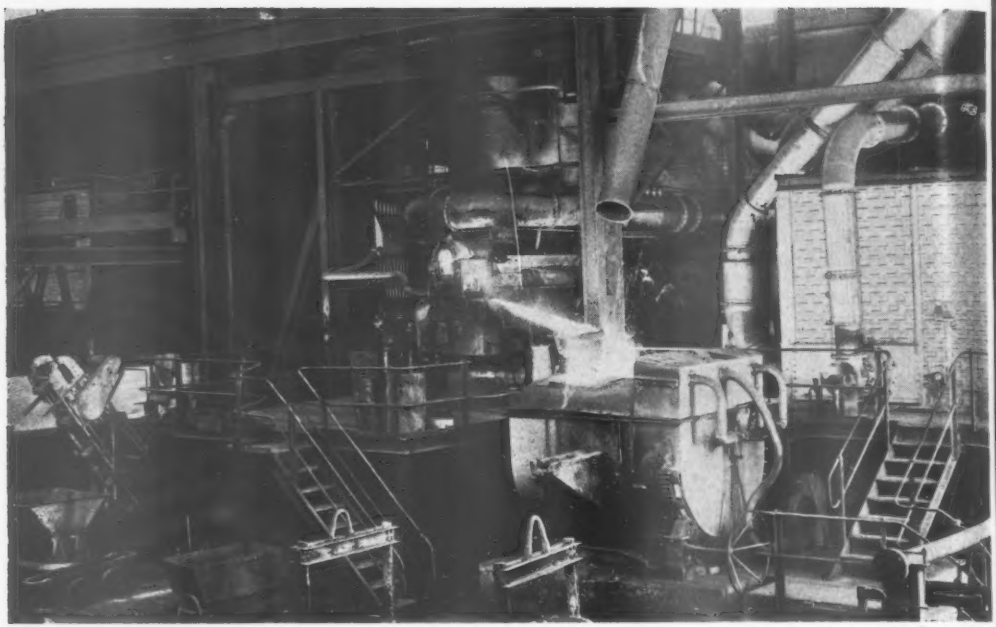
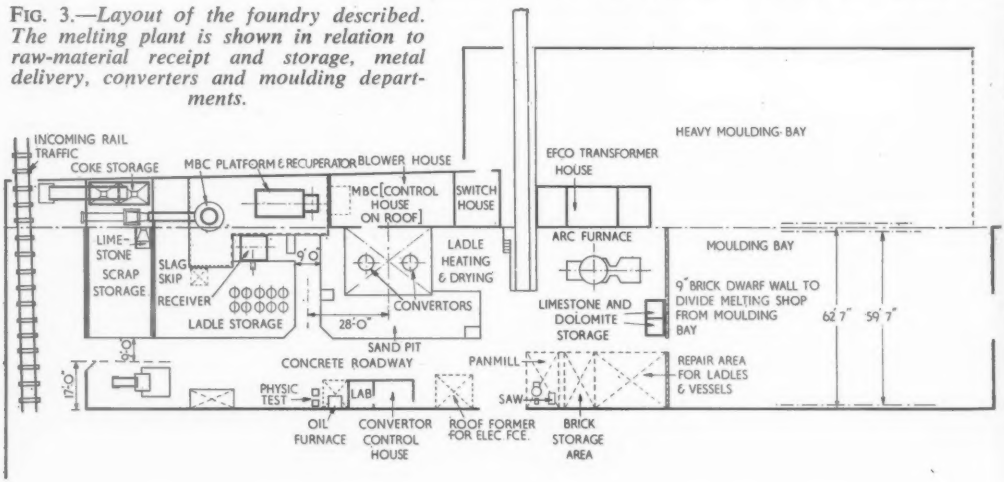


FIG. 2.—*General view of the MBC furnace, showing also the hot-metal receiver (foreground); recuperator (right), and slag-disposal (left).*

design have been described in the other accounts referred to, and repetition will not be made here, reliance being made on the accompanying illustrations, particularly the dimensioned plan and elevation drawings (Fig. 1) and the general view (Fig. 2). Suffice it that the design is orthodox for its type; the shell is 5-ft. 9-in. dia. and the monolithic lining 4-ft. 1-in. dia. inside. A recuperator of standard type is relied upon to heat the blast; this, like the rest of the installation, was furnished by Constructional Engineering Company, Limited, of Birmingham to approved designs. Fig. 3 is a plan of the foundry layout, showing the position of the furnace, its charging mechanism, blast heater, etc., in relation to the disposition of other plant.

The total cost of the installation was in the region

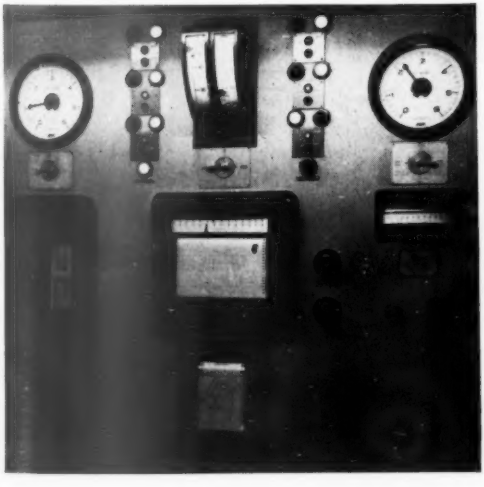
FIG. 3.—*Layout of the foundry described. The melting plant is shown in relation to raw-material receipt and storage, metal delivery, converters and moulding departments.*



FIGS. 4 AND 5.—*Views at ground level of the charging plant for the MBC unit. The man in the cubicle controls weighings into the chute above the skip by selective release from the magnet. (Note: the "picture" (Fig. 4 r.h.s.) on which an illuminated diagram shows the position of the gates within the cupola shaft.)*

of £60,000; this includes all the auxiliaries and controls, in addition to the charging plant. The latter was designed for operation by one man only, that man being situated at the controls of the magnet crane (see Figs. 4 and 5). Full instrumentation is provided for the plant, the control panel (Fig. 6) recording and permitting regulation of the operations being shown in Fig. 7.

FIG. 6.—*"Electroflo" control panel for the hot-blast cupola installation. (The purpose of each instrument is indicated in Fig. 7.)*



Operational Details

Throughout what follows, it must be remembered that the cupola/side-blown converter was being operated at the foundry as the major source of

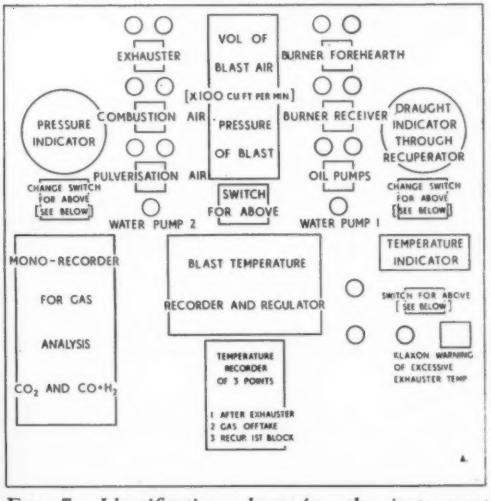


FIG. 7.—*Identification chart for the instrument panel shown in Fig. 6.*

The various change switches are employed as follows: (1) For gas-pressure indicator at (*a*) the distribution duct or (*b*) the gas offtake; (2) for blast-pressure indicator at (*a*) blast main or (*b*) windbelt; (3) for draught indicator in the combustion chamber at (*a*) top of first set of tubes, (*b*) between first and second and (*c*) between second and third tubes and (*d*) before exhaust, and (4) for temperature indicator in the combustion chamber at (*a*) top of first set of tubes, (*b*) between first and second tubes, (*c*) before exhauster and (*d*) at hot-blast offtake.

MBC Performance

supply of molten steel for casting. Thus, the major requirement from the cupola in this case was hot, low-silicon, low-sulphur metal for charging into the converters and this need is well furnished by the MBC plant (just as was initially promised) from charges consisting of 100 per cent. steel scrap. A typical melting-operation chart is reproduced in progress chart, Fig. 8, and the operators are to be congratulated on the comprehensive nature of the information recorded.

It will be seen that phosphorus (which, of course, depends solely on the amount charged) averaged between 0.040 and 0.048 from the converter. A typical MBC melt showed C, 3.75; Mn, 0.60; S, 0.04 (or less) per cent., and Si, 0.40 per cent. (the latter after making a suitable addition to the charge).

METALLURGICAL BLAST CUPOLA **DAILY MELTING RECORD**

MORNING	TIME			CHARGE No.	1	2	3	4	5	6	7	8
STARTING OF PREHEATER	8.00	COKE BED LEVEL	80cm	STEEL No. 1	8 CWT	4 CWT	8 CWT	8 CWT				
STARTING OF H.M.R.	10.15	QTY. OF BED COKE	–	STEEL No. 2		4 CWT						
START OF CHARGING	9.30	QTY OF LIMESTONE	3CWT	STEEL No. 3								
CUPOLA FULL	9.55	SILICA	1CWT	TOTAL								
BLAST ON	10.05	NUMBER OF CHARGES		COKE No. 2								
IRON TAPPING	11.00	FOR CUPOLA FULL	11	COKE No. 1	2 CWT	2 CWT	2 CWT	2 CWT				
SLAG TAPPING	12.30			TOTAL								
SWITCH from OIL TO GAS	11.15			FE-SI	5 lb	5 lb	5 lb	5 lb				
EVENING	TIME			LIMESTONE	77 lb	77 lb	77 lb	–				
END OF CHARGING	3.55	QTY. OF COOLING COKE	12CWT	FLUOR SPAR	10 lb	10 lb	10 lb	10 lb				
BLAST OFF	5.10	MAX. TEMP. REACHED BY GAS	1170°C	SODA ASH	–	–	–	–				
				QTY. OF CHARGES	20	45	14	6				

		RECUPERATOR									CUPOLA		AIR				GAS		IRON							SLAG					
		DRAUGHT					TEMPERATURE					PRESSURE	PRESSURE				ANALYSIS				ANALYSIS						ANALYSIS				
TIME	No. OF CHARGES	COMBUSTION CHAMBER	TOP OF 1st TUBE SET	BETWEEN 1st & 2nd TUBE SET	BETWEEN 2nd & 3rd TUBE SET	BEFORE EXHAUST	COMBUSTION CHAMBER	TOP OF 1st TUBE SET	BETWEEN 1st & 2nd TUBE SET	AFTER EXHAUST FAN	HOT BLAST OFF TAKE	GAS OFF-TAKE TEMPERATURE	GAS OFF TAKE	DISTRIBUTION DUCT	BLAST	WINDBELT	TEMPERATURE	VOLUME OF AIR	CO_2	$CO + H_2$	SAMPLE No.	TEMPERATURE	T.C.	Si.	Mn.	P.	S.	SAMPLE No.	SiO_2	CaO.	Al_2O_3	MgO.	FeO.	S.
10.00		0·75	0·80	1·55	1·50	1·70	1250	980	720	375	470	–	–	–	–	–	–	–	–	–	–	–	–	–	–						
10.30		0·75	0·80	1·60	1·55	1·70	1200	1050	740	380	435	–	–	–	54	44	345	4300	–	–	–	–	–	–	–	–						
11.00		0·75	0·80	1·55	1·50	1·70	1250	1050	755	382	445	420	–	–	53	44	360	4300	4·0	27·2	–	–	–	–	–	–						
11.30		0·20	0·25	1·00	1·10	1·46	1185	1065	775	400	475	500	1·60	1·40	53	44	380	4300	5·0	26·6	I	1380	3·82	·55	·60	·048	·093						
12.00		0·10	0·20	1·15	1·15	1·45	1180	1085	790	410	480	440	1·70	1·40	52	42	370	4300	5·0	26·6	II	1375	3·04	·37	·64	·041	·069						
12.30		0·15	0·20	1·10	1·10	1·55	1160	1085	765	410	485	410	1·75	1·50	53	43	395	4200	4·5	26·3	III	1350	3·50	·44	·72	·045	·061						
1.00		0·15	0·30	1·10	1·20	1·70	1140	1085	765	405	485	420	1·05	·90	53	43	395	4200	5·0	26·0	IV	1370	3·30	·24	·70	·049	·056		27·1	57·0	14·1		
1.30		0·15	0·20	1·15	1·10	1·70	1140	1075	770	410	480	425	1·45	1·15	52	42	395	4200	4·0	26·0	V	1340	3·30	·37	·66	·060	·053						
2.00		0·10	0·30	1·05	1·20	1·85	1150	1080	780	410	490	440	1·45	·95	52	43	400	4100	4·0	26·0	VI	1380	3·40	·46	·56	·049	·053						
2.30		0·00	0·05	1·00	1·05	1·30	1130	1060	765	405	495	470	1·35	1·10	53	43	400	4200	3·0	26·0	VII	1400	3·10	·23	·54	·042	·045						
3.00		0·00	0·00	1·05	1·03	1·35	1155	1092	790	415	495	505	1·75	1·45	52	43	405	4350	3·5	26·0	VIII	1400	3·50	·55	·58	·040	·046						
3.30		0·02	0·10	1·10	1·10	1·40	1110	1110	800	415	500	510	1·30	1·60	53	43	405	4200	3·0	26·0	IX	1410	3·80	·40	·66	·041	·049						
4.00		0·02	0·10	1·10	1·15	1·50	1110	1066	770	405	480	670	1·45	1·95	53	42	390	4400	3·0	26·0	X	1430	3·50	·51	·60	·039	·040						
4.30		–	–	OFF	–	–	780	880	530	310	375	–	–	–	52	35	370	4500	5·5	26·3	XI	1400	–	–	–	–	–						

FIG. 8 (*pages* 488-89).—*Combined MBC furnace and converter operational chart, showing melting trends, additions and full record of data collected.*

Fig. 8, from this it will be seen that the cupola metal as tapped averaged about 0.05 sulphur at about the fourth converter charge after starting up. This metal was still further desulphurized in the ladle by double or treble treatment with soda ash, to bring it to 0.02 per cent. S, before pouring into the converter. It must be emphasized that only with metal at such a high temperature as that emanating from the MBC furnace, was it found possible to do this without disastrous temperature loss. The rest of the composition and its variations during the progress of a day's melting and steel-making operations is clearly shown in the melt

When the temperature of the metal as tapped was at a maximum, there was not so much need for silicon to be added; it is interesting to record, however, that early claims made for slight silicon pick-up were not substantiated at the MBC installation examined by the writer.

Lining Materials

Teething troubles when the furnace was initially brought into operation were mainly found with the automatic tapping spout (Fig. 9) and unsuitable furnace linings. All these were satisfactorily overcome and much valuable experience was gained.

At the time of the writer's visit, a monolithic graphite-base furnace lining had been newly installed. At that time it had outlasted a throughput of 1,400 tons of metal melted and appeared good for double that. This material was obtained from Norway as a semi-solid mass which can be softened on heating (probably because of a tar bond); it was rammed in position while hot, much in the same manner as tar/dolomite mixtures. The tapping box was also rammed with this material, but in the upper part of the furnace the lining started off with 3-in. firebricks, of which only about 1 in. or so still remained. The brickwork in the throat was preserved from shock damage during charging by double doors situated at the top of the shaft.

Typical Working Schedule

A typical cupola charge was: 8-cwt. steel scrap; 2-cwt. coke split 77-lb. limestone, and 10-lb. fluorspar. Each night at shut-down, a charge of "cooling coke" was added after the last charges had been melted and, after the metal had been drained, the furnace was left sealed overnight.

Blast was being supplied from a Keith Blackman fan, rated at 32,000 cub. ft. per min. at 52-in. water gauge, its control being embodied in the main panel—based on continuous analysis of shaft gas (see Figs. 6 to 8), which averaged about CO_2, 3.0 and CO plus H about 26.0 per cent. About 150 gall. of light fuel are needed at the start of each melt for pre-heating the recuperator and there was an additional oil burner located at the slag notch because the slag—being basic—can be quite viscous.

Day of Campaign 24th Date 20/4

DAILY CONSUMPTION	Tons	Cwts.
SCRAP No. 1	25	0
SCRAP No.2	9	0
SCRAP No. 3		
TOTAL	34	0
COKE No. 1	9	2
COKE No.2		
LIMESTONE	3	1
FLUOR SPAR		7½
SODA ASH		
FUEL OIL	286 GALL.	
Fe-Si	-	3¾

DAILY PRODUCTION	Tons	Cwts.
IRON	35	9
CUPOLA LOSS +	4	9%
STEEL	32	3
CONVERTER LOSS	12·6	6%
TOTAL DAILY LOSS	8·6	9%

MISCELLANEOUS
POTS
STOPPERS
NOZZLES
SLEEVES
CONVERTER No.
CONVERTER No.
LADLE No.
LADLE No.

NOTES

CONVERTERS

TIME	HEAT No.	BLOW No.	TYPE	WT. CUPOLA METAL Tons.	Cwts.	ADDITIONS Fe Si	Fe Mn	Si Mn	Spieg	Al			Cupola Heat	WT. FINISHED STEEL Tons	Cwts.	STEEL ANALYSIS C.	Si	Mn	S.	P.
	16 18			1	16		51	-	34	-				1	11	·21	·32	·90	·047	·044
	16 19			1	16		51	-	34	-				1	12	·21	-	·90	-	-
	16 20			1	16		62	46	-	11½				1	14	·25	-	1·50	·035	·043
	16 21			1	14		-	9½	-	11				1	11	·135	-	·94	-	-
	16 22			1	16		56	46	-	8½				1	9	·215	·28	1·40	·019	·044
	16 23			1	14		48	-	32	-				1	11	·22	-	·70	-	-
	16 24			1	16		56	46	-	8½				1	12	·225	-	1·36	·021	·044
	16 25			1	14		53	43	-	8				1	12	·225	-	1·36	-	-
	16 26			1	16		56	46	-	8				1	14	·23	·35	1·4	·019	·041
	16 27			1	14		59	43	-	11				1	12	·225	-	1·46	-	-
{	16 28			1	16		43½	-	34	-			COMBINED.	1	13	·21	-	·74	·018	·042
{	16 29			1	14		40½	-	32	-			COMBINED.	1	12	-	-	-	-	-
	16 30			1	16		62	46	-	11½				1	10	·225	·37	1·56	·018	·042
	16 31			1	14		53	43	-	8				1	11	-	-	-	-	-
	16 32			1	16		51	-	34	-				1	14	·22	-	·82	·024	·046
	16 33			1	14		-	35	-	12			2½ CWT	1	12	·41	-	·70	-	-
	16 34			1	16		56	46	-	8½				1	13	·205	·31	1·12	·015	·041
	16 35			1	14		53	43	-	8				1	12	·20	-	1·34	-	-
	16 36			1	16		56	46	-	8½				1	13	·20	-	1·38	·016	·042
	16 37			1	16		51	-	34	-				1	15	·21	·36	·78	-	-

Charging

The furnace-charging system, as stated earlier (Figs. 4 and 5), was made completely automatic, to be operated by one man at the controls of the magnet, the coke measure, the inclined drop-bottom-bucket hoist and the furnace doors. To receive a charge, the light-section steel doors at the top of the furnace shaft open upwards by movement of the skip as it approaches and these again close to contain the charge before the lower doors, of heavier construction, open downwards to deliver a charge in the furnace. The door positions are indicated automatically to the man at the controls. Difficulty can be experienced when the steel scrap available is too light in section, as then its bulk exceeds the charge-skip capacity. Also, if the quality of the scrap be poor, double or treble desulphurization of the metal in the ladle is required. Automatic granulation of slag issuing from the furnace was arranged for, there being a bucket elevator to take slag from the settling tank to the disposal unit.

Supplementary Data

At the time of the writer's visit, a total of six men was employed on furnace operation and control against five previously, but in fairness it should be pointed out that two of these were engaged partly on coke and limestone handling for which the automatic system was not then working properly. The recuperator had available at times more fuel gas from the cupola than was needed and, as at that time no plant existed to employ this, some was wasted. Furnace cooling was being effected by water sprays on to the shell and it is interesting to record that the spindle of

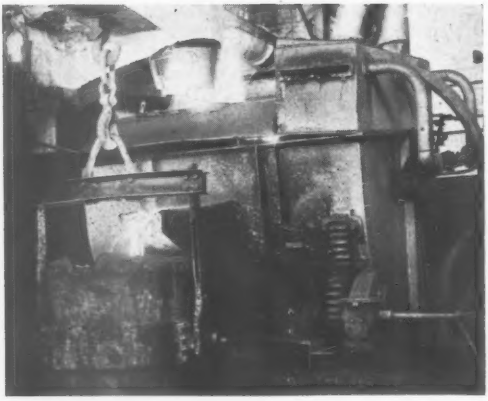


FIG. 9.—*Automatic tapping spout (top, left) delivering metal from the cupola to the heated tilting receiver.*

the lower charge-doors was also water-cooled. The cooling water was being drawn from the general works supply in which two pumps were incorporated, each rated at 410 gall. per min. at 220-ft. head. About 50 per cent. of the capacity of one pump was needed for MBC cooling.

The cost of cupola/converter metal at the moulds (excluding labour charges) was somewhat lower when using the MBC than when employing cold-blast cupolas. Unfortunately, soon after the installation was completed, a change in the local tariff, coupled with increased availability of power (the works suffered very heavily at one time from power-cuts), made electric-arc furnace melting of steel much more attractive than hitherto. The relative figures were:—

	Cost per ton of molten steel in ladle
(*a*) Cold-blast cupola/converter ..	£23 10 0
(*b*) MBC cupola/converter ..	£21 5 0
(*c*) Basic electric-arc furnace ..	£17 3 0

Thus, the MBC cupola-converter process showed a saving of 45s. per ton over cold-blast practice, but was more expensive than basic electric melting at the cost of raw materials and electricity later ruling in the area. Experiments recently conducted indicate that a cheaper coke will function more satisfactorily in the MBC than in a normal cold-blast unit. Early operations indicated that a "life" of 16 weeks could be expected from a lining, though with the comparatively low daily melt of 25 tons, this was hardly a fair assessment, as with larger daily throughput or continuous operation—for which the furnace was designed—much larger tonnages per lining would be expected. Generally speaking, other charge materials also could be of cheaper quality for the MBC unit, but there would be a physical limit to the amount of turnings which could be accommodated.

Czech Iron and Steel Project

Revival of a project to build a large iron and steel works at Kosice, eastern Slovakia, was announced at the end of a conference of Czechoslovak metallurgists held in Vienna recently. Mr. Hlavacek, director of the Prague Iron and Steel Planning Bureau, was quoted as saying that the largest coking, iron-ore processing, and iron and steel production plants in Czechoslovakia would be built at Kosice and tens of thousands of workers from rural east Slovakia would be employed in its building and eventual operation.

It is understood that the project is probably a continuation of one which, in company with a number of other ambitious projects, was begun in 1950 and which was stopped when the excavations had been made.

The reasons for the revival of the scheme are obscure and appear to conflict with a recent statement that in future there would be no more giant industrialization schemes, but certain political considerations also have to be taken into account.

Fighting Industrial Diseases

British doctors have made notable advances in their investigations into industrial diseases and 11 doctors from nine European countries are attending a British Council course on the diseases which began in London on April 14. The course ends tomorrow. The programme concentrates on protection against radioactivity, poisoning by metals, dangers from pesticides, and fluorosis, silicosis, and other lung diseases.

Apart from formal demonstrations and lectures, the specialists last Thursday visited the Harlow Metal Company, Limited, to see how the company is tackling its health problems. At the same town they also visited the pioneer industrial health centre.

Newton, Chambers' Record Year

For the first time in the history of Newton, Chambers & Company, Limited, ironfounders, structural engineers, etc., of Thorncliffe, Sheffield, gross profit, before depreciation, etc., exceeded £1,000,000 in 1957. The profit before tax increased by £88,684 to a record £805,855.

This increase in profit, states the chairman, Sir Peter Roberts, justified the capital expenditure of over £1,000,000 in the past two years. Last year, expenditure of £553,000 was incurred and there are year-end commitments to the extent of £326,000, and a further £200,000 may be required this year.

Fixed assets increased by £395,732 to £1,931,143 and current assets advanced by £564,827 to £4,807,166. The greater part of the expansion was financed out of retained profits and by the realization of certain trade investments, but it was necessary to increase the borrowing from the bank from £255,546 to £679,469. Net profit rose from £296,338 to £336,855, and the dividend is raised to 16 (15) per cent.

Music in Miniature

A violin only 7-in. long and carved out of Swiss pine was one of more than 70 pieces of handicraft by employees of the Staveley Iron & Chemical Company, Limited, and the Sheepbridge Company, Limited, on view at the firms' annual handicraft and art exhibition. The violin was the work of Mr. Arthur Riley, a 54-year-old patternmaker, who spent more than 2,000 hours on it.

Another exhibit, a matchstick model of Worksop Priory, is the subject of a competition in the works magazine. Employees are asked to guess how many matchsticks were used. The model was made by Mr. C. Wainwright.

The Earliest "Furnaces"

By F. Evans O.B.E., M.A.

The making of wrought iron and steel by the indirect method of producing cast iron first and processing this afterwards is of comparatively recent date in the history of iron-making. The casting of iron developed first in the 14th century and the invention is attributed to France and Flanders.

The primitive method of extracting iron from its ore was the direct one in which were used sample "bloomeries" such as still can be seen functioning in some African villages. It is a common error to believe that these were always situated on hill-tops in order that the winds should blow through them. On the contrary, simple bellows made of skins or leather were used to provide the blast and these became quite efficient, within their limits, when the bellows clap-valve was invented in the 4th century.

Fig. 1 shows (*a*) a plan and (*b*) a section, of how these bloomeries were probably constructed. They were situated near to localities in which supplies of ore, charcoal lime (forflux) and water were available and for this reason were rarely on high ground.

The ore, charcoal and flux were placed in layers over a fire of charcoal, on a hard clay or stone bed of saucer-shape, so as to present a beehive-like appearance. Then a clay outer cover was built over this, leaving holes at ground level for the entry of bellows funnels and also, at a slightly higher level, a plug-hole through which the fused dross could be drawn off. At the bottom of the cupola a spongy mass of ductile iron formed after some hours of blowing and then this was allowed, after the dross had been tapped, to cool off. This mass at the bottom consisted mostly of iron but it also contained some impurities, like cinders and pieces of charcoal.

The cupola was then broken open and the ductile mass of iron re-heated and beaten by sledge-hammers to force out the impurities. In other words, it was "wrought." First, this was done laboriously by hand but later water power was used to turn great water-wheels which worked heavy trip-hammers—and from this practice is derived the term "hammer ponds." Many of these ponds still remain in the Weald of Kent and Sussex.

Sometimes, the carbon content of this iron resulted in a steely-iron or even a steel being produced so that implements made from the iron of these early bloomeries are often nearer to steel than to the softer wrought iron. Tempering by quenching in water had been discovered in Asia Minor about 1400 B.C. so that the best arms and tools of the Iron Age peoples were, to say the least, of a steel-like material. Sometimes, the blast into these bloomeries was so efficient that the "bloom" became in effect cast iron and thus unsuitable for being "wrought." In later years when the "indirect" method of making steel was developed many of these discarded "blooms" of cast iron were collected and used again in the later blast-furnaces. This took place especially in the Forest of Wear.

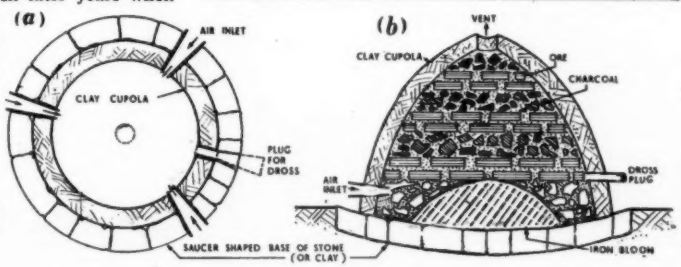


FIG. 1.—*Reconstruction of an early bloomery, showing* (*a*) *plan and* (*b*) *section.*

Foundry Knowledge Essential to Engineers

A report on practical training by a special committee of the Council of the Institution of Mechanical Engineers was introduced at a recent Press conference. In discussion it was disclosed that knowledge of the rudiments of foundrywork is now considered one of the basic necessities of an engineer's training. The report is of a provisional and tentative nature and although the Council has not yet adopted its proposals as policy, it was decided that the work should be issued for outside comment. Mr. H. G. Conway, chairman of the committee, making a general statement about the aim of the report, said that the committee was convinced that the academic and practical aspects of training were insufficiently integrated. It was true, he commented, that the so-called "sandwich course" was a step towards such an integration, and it should also be remembered that some individual firms had synchronized the two forms of training. However, broadly speaking, a divorce between practical and theoretical persisted, he said. The feeling of the committee was that a certain basic practical training was indispensable.

Practical Work Envisaged

Citing the example of his personal experience, Mr. Conway said that he found that, never having had even a few weeks' practical experience of foundrywork, despite all his engineering background, it was still difficult for him to evaluate drawings of castings. It was gaps such as these which the committee's proposals were designed to obviate. Thus the basic training would consist of a series of practical "exercise components" to be made under skilled supervision. These would comprise the making of parts on the lathe, components for which various types of cutter and milling-machine equipment must be utilized; the making of moulds and castings, and test-pieces to illustrate the basic problems of welding. What must at all costs be avoided, Mr. Conway continued, was the integration of the trainee into the works in such a manner that he found himself confined, for example, to working on the lathe with but a minimum of instruction. While the report was directed, in the main, to the graduate student, of between 17 and 19, some of its provision might eventually be applied in the field of engineering apprenticeships.

AN ORDER worth about £5,000,000 has been received by the Metropolitan-Vickers Electrical Export Company, Limited, from Agua y Energia (the Argentine Power and Water Board) for the supply and construction of seven 132,000-volt sub-stations to be installed in the Buenos Aires city area. It is the largest order for this type of equipment to be placed with the company.

Canadian Trade-Mission in Reverse

To promote further measures for the development of Anglo-Canadian trade and to follow up the successful visit to this country last year of the Canadian trade mission, a Canadian coast-to-coast tour is to be undertaken by a British Dollar Exports Council delegation, led by Sir William Rootes, chairman and director of a large number of companies associated with the motor-car industry. The delegation leaves London Airport to-morrow and will visit Ottawa, Montreal, Halifax, Quebec City, Toronto, Winnipeg, Regina, Edmonton, Calgary, Vancouver, and Victoria.

At a dinner in Montreal organized for the delegation by the Dollar Sterling Trade Council, the principal guest will be the president of the Board of Trade, Sir David Eccles, who is visiting Canada for two days on his way to Venezuela and Brazil.

Tour Arrangements

Arrangements for the tour in Canada have been made by the Dollar Sterling Trade Council in conjunction with the Canadian Association of British Manufacturers and Agencies, and discussions will be held with the Federal and provincial governments, the UK High Commissioner and Trade Commissioners, the Trade Council and its newly-established regional committees of leading Canadian industrialists.

Sir William will be supported by:—Sir Charles Hambro, chairman of the DEC financial advisory panel; Sir Edward Herbert, chairman of the DEC North American Committee, part-time director of the East Midlands Divisional Coal Board, chairman of Aron Electricity Meter, Limited, and director of a number of companies; Sir Norman Kipping, director-general of the Federation of British Industries; Lord Polwarth, chairman of the Scottish Council (Development and Industry); Lord Riverdale, president of the Association of British Chambers of Commerce, chairman of Arthur Balfour & Company, Limited, and chairman and director of a number of steel companies; Sir Vincent Tewson, general secretary of the TUC; Mr. Henry F. Tiarks, a director of a number of companies including Joseph Lucas (Industries), Limited, and the Pressed Steel Company, Limited; Mr. J. V. Morrison, representative of the Northern Ireland Development Council; Mr. E. D. O'Brien, honorary public relations adviser, and Mr. P. S. Young, chief executive of the council.

Babcock & Wilcox Atomic Power Plant Deal

Detailed design, manufacture, and erection of the reactor pressure vessels forming part of nuclear-power stations to be supplied by Atomic Power Constructions, Limited, and its member companies will be undertaken by Babcock & Wilcox, Limited. Crompton Parkinson, Limited, International Combustion (Holdings), Limited, Richardsons Westgarth & Company, Limited, Elliott Bros. (London), Limited, Fairey Aviation Company, Limited, and Nuclear Civil Constructors form the Atomic Power Constructions group.

Babcock & Wilcox will also supply any special heavy-duty cranes required by the atom company for the erection of pressure vessels, heat exchangers, and other parts of the gas circuits, and is at present building a 400-ton "Goliath" crane for the nuclear-power station at Hinkley Point.

World Economic Development

At a conference in Coventry on April 12, organized by the United Nations Association to consider the problems of promoting world economic development, one of the principal speakers was Mr. K. J. Burton, secretary of the British Employers Federation. Outlining the role of management in the problem, Mr. Burton said that the credo of the post-war years "the world owes me a living" was now outmoded. He added that he did not regard it as a bad thing that many young Britishers were seeking to build their careers abroad as such emigrations were often a source of benefit to UK industries since they brought more security to investments overseas by raising the standards of business contact.

Mr. Burton said that he was doubtful of the wisdom of an approach in world economic development on the basis of free grants from one nation to another. "We must guard against generalizing too readily about under-developed countries," he said, "as their circumstances and prospects vary greatly." The most useful contribution, he suggested, would be to expand the channels of international trade.

Technical Aid

Mr. Gordon Menzies, head of the United Nations European Office of Technical Assistance Recruitment, asked British employers to induce engineers and scientists to take temporary jobs with the United Nations to help in advising backward countries on new developments. He wanted private industry to gives improved terms under which experts could be released from their regular work for certain periods. There were sometimes fears that technical assistance to under-developed countries would serve only to create new competition and ruin our own markets, he said, but it was by competition that the UK could increase productivity and turn out better goods at lower prices. The under-developed countries were determined to industrialize, and if we did not give them assistance and goodwill they would simply seek aid from elsewhere.

Mr. E. W. Hancock, chairman of Coventry Productivity Association, welcomed delegates to the conference with the Lord Mayor of Coventry, Alderman Mrs. P. M. Hyde. Other speakers included Sir Alfred Roberts, chairman of the International Committee of the Trades Union Congress, Mr. Arthur Gaitskell, a member of the Colonial Development Corporation, and Mr. A. P. Young, founder vice-president of the Institution of Works Management.

Unemployment Up 0·3 per cent.

Highest point in UK unemployment for five years was reached last month when there were 433,000 workers out on March 17. This was 2 per cent. of the total working population, compared with 1.7 in March, 1957. The total rose by 9,000 between mid-February and mid-March. In Northern Ireland unemployment reached 10.7 per cent. on the same day.

The number in civil employment again fell during February by 36,000 to 23,057,000, the drop being most marked in engineering, textiles, and distribution. The number of workers on short-time in manufacturing industry rose during February by 21,000 to 103,000 and the number on overtime fell, since last November, by 150,000. By the middle of March there were almost exactly two people out of work for every vacancy on employment exchange books.

European Foundry Apprentice Competition

Preliminary Arrangements for UK Participation in 1958 Event

The organizing committee for the United Kingdom for the European Foundry Apprentice Competition (honorary secretary Mr. J. J. Collett) operating from 14, Pall Mall, London, S.W.1, has prepared the following statement for circularizing to all firms in the country's foundry industry, about the forthcoming competition in 1958:—

The European Foundry Apprentice Competition was inaugurated in 1957 by the European Committee of Foundry Associations as an annual event to encourage craftsmanship and knowledge of foundrywork among apprentices. The competition will be held in turn in each country represented on the European Committee; this year it will be held in November, in Paris. Last year the competition, held in Stuttgart, was won by German apprentices, closely followed by those from France. The three apprentices chosen to represent the United Kingdom, however, though not the winners, were a credit to their employers and the British Foundry industry as a whole. This year, with more time to select and prepare competitors, better results are expected.

UK Arrangements (1958)

UK competitors for the 1958 competition must be under 20 years of age on December 31, 1958. The competition will consist of a practical test in moulding and coremaking lasting up to eight hours; this will carry more than half the total marks. There will be written tests in foundry technology, calculations (both of two hours duration) and drawing (of three hours). All competitors will receive a diploma and the winners, both individual and team, will receive trophies.

The UK foundry associations and the Institute of British Foundrymen have set up a joint committee to organize British participation in the competition, and the IBF has agreed to conduct preliminary screening of eligible candidates by means of uniform written tests. These will be set early in June, at appropriate local centres. On the basis of the results of these tests, and the assessment of a candidate's practical ability, made by his foundry manager or other responsible person, a "short list" of entrants will be compiled. These candidates will then be called to regional centres, or one national centre, to take a practical test, to be held in September next. The written and the practical tests will be judged by panels drawn from all sections of the foundry industry.

How to Enter

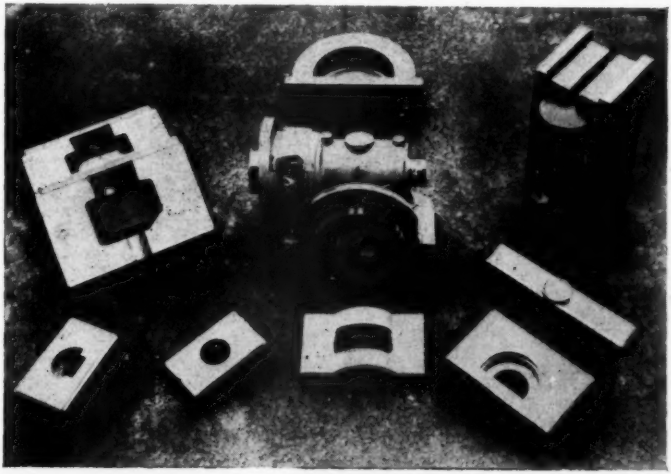
As a first step, a nomination form must be completed in respect of each candidate, up to three nominations of their personnel may be made by each firm. Nominees should (normally) have obtained a City and Guilds Intermediate Certificate in Foundry Practice, or an equivalent certificate, or have received technical training to an equivalent standard. The written tests to be set in the preliminary screening of candidates will be at a lower level than expected in the competition.

Travelling and other expenses incurred by candidates in the course of the selection procedure will, it is hoped, be met by employers. A special preparatory training programme will be arranged for the three candidates finally chosen to represent the United Kingdom, and it is expected that their employers will be willing to release them (with pay) for this purpose. The organizing committee will, however, meet the expenses of the three competitors when taking part in the competition in Paris unless their employers wish otherwise.

Undoubtedly, this competition can be of the greatest value in stimulating interest in foundry apprenticeship and in raising standards. Extra nomination forms are obtainable from, and all should be returned when completed to, the secretary of the organizing committee, at the address given above, by Tuesday, May 20.

The above statement is signed by Mr. J. Blakiston, president, IBF; Mr. W. Brown, chairman, Light Metal Founders' Association; Mr. P. B. Higgins, president, Association of Bronze and Brass Founders; Mr. G. M. Menzies, chairman, British Steel Founders' Association, and Mr. N. P. Newman, chairman, Council of Ironfoundry Associations.

The nomination form, which is being sent to all foundries along with the statement, requests the following information about the candidates whose names are submitted: Last school attended full-time; name and address of employer; date of commencement of apprenticeship; details of practical training and type of work undertaken (whether or not some practical training has been received in a training centre), and the type of work of which the candidate is considered capable (including types of jobs which the candidate has successfully undertaken by himself). As to technical training, the actual technical college attended, subjects studied, stage reached, and results of examinations taken are to be given. Finally a recommendation has to be completed by the head of the firm, the works or foundry manager.



The pattern and coreboxes supplied to competitors in the 1957 competition are illustrated alongside. In the practical test, competitors will be required to make a casting in the metal of their choice, using the pattern equipment provided and sands of which the properties will be specified. The maximum size of moulding box used will be 24 in. by 24 in. The total time allowed for the practical test may be up to 12 hours, of which at least four will be allowed for moulding. Competitors will be judged on their method of working as well as on the finished casting.

Law Cases

Hydroblasting and Dermatitis

Lord Migdale dismissed in the Court of Session, Edinburgh, an action against John Lang & Sons, Limited, lathe manufacturers, ironfounders, etc., of Johnstone (Renfrewshire) for £1,500 damages brought by an employee, Mr. Peter Heron, who claimed that he contracted dermatitis while engaged in the Hydroblasting of castings. The judge held that the workman had not established that the employers were unreasonable in failing to anticipate that he would contract dermatitis. In any event, he did not think they had failed to take reasonable precautions to reduce the risk.

In his judgment Lord Migdale explained that the process, comparatively new in this country, involved the directing of a high-pressure jet of water and sand by a hand gun to clean off the sand adhering to the casting. The company's plant was installed in 1946 and was the first of its kind in Scotland, though there were now nine or 10 such installations. It was introduced in industry to overcome the risk of pneumoconiosis, but, according to the medical evidence, it carried with it an inherent risk of dermatitis, which one witness had put as high as the risk of irritation of the lungs in dry sand-blasting.

At the same time, said Lord Migdale, evidence was given by witnesses for the employers that they had not heard of any case of dermatitis resulting from Hydroblasting, though Dr. James Sommerville, a Glasgow dermatologist, giving evidence for the plaintiff, expressed the view that anyone who followed Hydroblasting as an occupation ran the risk of contracting dermatitis sooner or later, whatever precautions were taken. The witness agreed, however, that this was the first case of its kind he had come across.

Dr. George Harvey, who is in charge of the Department of Dermatology at Glasgow Royal Infirmary, had said in evidence that he knew of at least three other cases of dermatitis arising from Hydroblasting.

Toolsetters must use guards

At Birmingham Assizes Mr. Justice Devlin awarded £500 damages to William Henry Broughton (45) an employee of Joseph Lucas, Limited, who had lost most of the fingers of his right hand in an accident involving a power press. The Judge said full damages would have been £1,000 but he found the man and his employers were equally responsible. He pointed out that until 1948 it was thought toolsetters were exempt from the safety Regulations because they often had to make trial runs with a machine before getting the correct setting. In that year, however, it was decided in the High Court that toolsetters were not exempt. The firm had prepared a notice to that effect but, said Mr. Justice Devlin, "I strongly suspect it was an issue about which neither side wished to be too precise."

Mr. Broughton said that the superintendent and the foreman told the operators to ignore the notice. The company had had men sign a notice to the effect that guards must be replaced each time for trial runs but the order was not popular among the men as it added to their work. At the time of the accident in question the press had made an uncovenanted run and come down on plaintiff's hand.

WINSTON ELECTRONICS, LIMITED, Shepperton (Middx), has received an Italian order worth £70,000 for spectrum analysers, highly stabilized decade oscillators, and other electronic equipment.

Parliamentary

Debate on Cast-iron Baths

In the House of Commons last week a question was put to the Minister of Works, MR. HUGH MOLSON, about the current output of cast-iron baths. MR. J. W. BARTER (C. Ealing North) asked what was the output of cast-iron baths in the United Kingdom in 1957; to what extent this was sufficient to meet the home and export demand; and to what extent it was anticipated that United Kingdom manufacturing capacity will exceed demand during the current year.

The Minister of Works said that he regretted that figures of output of cast-iron baths were no longer collected so that he could not answer the first or last parts of the question. He was satisfied, however, that present capacity was sufficient to meet both home and export demand.

MR. BARTER asked the Minister to bear in mind that there was a surplus of capacity in the British bath-manufacturing industry, and requested him to call the attention of the President of the Board of Trade to this fact so that he too would be aware of the circumstances in which the Socialist-controlled Barking Borough Council could specify baths of Hungarian manufacture, thus creating an embargo on the products of British workmen.

MR. MOLSON replied that he had no reason to suppose that this small importation of Hungarian baths under a payments agreement was having any adverse effect upon the large British production. MR. S. HASTINGS (Lab. Barking) asked if the Minister was aware that great trouble was taken by the Barking Borough Council to obtain what it wanted, and that, because it was unsuccessful in getting British goods, it had to go abroad for them?

MR. MOLSON said that he was not aware of that, but was extremely glad to know that the Barking Borough Council had obtained what it wanted. He had no doubt, however, that very satisfactory baths were also produced by the British industry. DAME FLORENCE HORSBRUGH (C. Moss Side) asked if the Minister could suggest in what way it was thought that a Hungarian bath is better than a British bath. No reply was returned to this question.

More Orders for North British Locomotive

Increased output leads the directors of the North British Locomotive Company, Limited, Glasgow, "confidently to anticipate" that the company will this year again be earning a profit—even if it is not a very big one. The works will be fully employed for some time to come with existing orders, states the chairman, Mr. T. A. Crowe, but the question of building up a labour force still remains. During 1957 value of new orders amounted to some three times the average annual value of orders received during the preceding five years.

Mr. Crowe adds: "A considerable amount of the plant necessary to change over from the manufacture of steam to diesel locomotives has still to be delivered and paid for. Such expenditure, together with the cost of financing the increased value of work in progress, has caused a heavy strain on resources."

In 1957 the group net loss was reduced from £400,016 to £58,414 after crediting recoverable tax of £22,117 (£85,867, and repayments and surplus provisions of £22,200 set free). No dividends are being paid. Gross preference arrears since January 1, 1956, amount to £75,000.

Consideration for Imparting of Know-how: Capital or Trading Receipt?

By "Barrister-at-Law"

Questions of considerable practical importance have been raised by the recent decision of the House of Lords in the case of Moriarty *v.* Evans Medical Supplies, Limited, and new principles may be regarded as emerging, to some extent, as the result of that decision, which are not without possible parallels in foundry practice.

In that case the company carried on the business of manufacturing pharmaceutical products, and wholesale druggists, with world-wide sales. Under an agreement made with the Government of Burma, where the company had an agency, the company agreed to supply to that Government information as to certain secret processes relating to the manufacture of pharmaceutical products and technical data, drawings, designs and plans for the erection of a factory and the installation of machinery therein. The agreement further provided for the performance of certain services by the company and the consideration to be received in return was £100,000.

The question before the Lords arose as to whether this sum was a capital receipt. The Court of Appeal held that as far as the consideration was in respect of the imparting of information as to secret processes, the receipt was a capital receipt, such secret processes and formulæ being in this respect akin to patents. On the other hand, in so far as the consideration related to the drawings, designs and plans and information relating to the supply of prototype machinery, and the manner in which the factory should be laid out, and the machinery should be installed therein, and the like matters, it was a payment for services, and would constitute part of the trading receipts of the company. The Court of Appeal accordingly directed, that the extent to which the sum of £100,000 should be apportioned on this basis should be referred to the Tax Commissioners. The part of the consideration apportioned to the secret processes would accordingly have been a capital receipt whereas the remainder would constitute a trading receipt.

From this decision both the Crown and the company had appealed to the House of Lords. The House held by a majority that the whole of the £100,000 was a capital receipt, and that there was no case for apportioning the sum in the manner directed by the Court of Appeal.

"All or Nothing"

In this connection it is important to observe, that both the Crown and the company had throughout argued the matter on the basis that it was all or nothing. That being so, it would appear that no question of apportionment could have arisen, since neither of the parties had raised such a point. But apart from this procedural difficulty, it is of interest to observe that both Viscount Simonds and Lord Denning considered that it would be difficult to separate the value of the secret processes imparted from the value of the services rendered in imparting it.

As Lord Denning pointed out in his judgment, the only question of law which was stated for the opinion of the Court was whether the sum of £100,000 was properly included in the profits of the company and not whether any part of that sum was properly included in the profits. In his view, the £100,000 was an entire sum paid for a specific consideration, that consideration being the imparting of information and technical data, in other words "know-how." There could be no sensible distinction between money paid for information on secret processes and money paid for the information in respect of the collateral matters referred to above, in relation thereto. The House of Lords accordingly held that the whole sum of £100,000 was a capital profit of the company and accordingly was not taxable.

Grounds of the Decision

It is of interest to examine the grounds of this decision. One of the major points that arose was as to whether there was a distinction between imparting the knowledge to the whole world, on the one hand, and imparting it to one person, such as the Government of Burma, as in this case. That disclosure to the world at large of secret knowledge would constitute the destruction of an asset, which could formerly be turned to account by the holder of that secret knowledge, is obvious. Thus, in the case of Handley Page *v.* Butterworth (1933) (19 T.C. 301) disclosure to the world of secret processes, was held to constitute such destruction, with the result that the payment received for the disclosure was held to constitute a capital receipt.

The principle underlying such cases was examined by Lord Greene, in Hathersole *v.* Withers 1946, 1 A.E.R. 711), and an important test, though not perhaps an absolutely conclusive one, may thus be formulated. Where a piece of property, such as copyright—or one must now add, know-how—is turned to account in such a way that its owner still retains the reversion to the property by reason, for instance, of his conferring limited rights to others to exploit that property, which however will ultimately come back to the owner *intact*, any sum received by the owner for granting such rights, whether in the form of a single lump sum or of periodical payments, is to be regarded as income enjoyed by the owner from that "property." Such a payment or payments therefore will be taxable.

Where, however, the asset is of a *wasting* nature,

Imparting of Know-how

if the property is permanently diminished or injuriously affected, the owner will thereby as a result of the transactions he may have entered into, have realized part of the capital value of that property, and to that extent therefore the consideration received will be regarded as a capital receipt by him, and accordingly not taxable.

Application of "Know-how"

That the principle will extend equally to the transfer of information as to secret processes, and further as to the best methods of their operation and the like, in other words know-how as it is popularly expressed, must now be regarded as having been clearly established by the decision first referred to. If the owner of the know-how parts with that knowledge and the effect of it is to destroy any further value that the know-how may have had for him then he has parted with his capital asset and the payment received therefore is a capital receipt.

On the other hand, if he retains the know-how, or at any rate the reversion to the know-how, then provided that the know-how will still have some value for him when it returns to him, then it may be said that the consideration for the use of the know-how in the meantime is an income receipt.

Peculiar Character of "Know-how"

While these clearly are the principles to be applied in determining whether the consideration is a capital or an income receipt, the particular nature of the know-how may be such that once it is imparted, its value to its owner is reduced virtually to nil. On the facts, it appears that this was an important issue in the Evans Medical Supplies' case. The Crown stressed the point that the know-how had been imparted merely to one person, *viz.*, the Government of Burma and not to the world, and that, therefore, the reversion and ownership in the know-how was virtually intact as far as the company was concerned. But the House of Lords declined to draw any such inferences. In their view the company had in fact parted with a capital asset, and has received a capital sum as the consideration therefore. It was pointed out that the ownership by the company of these secret processes and know-how had enabled it to acquire a substantial share of the market for pharmaceutical products in Burma. By its loss, the company's Burmese agency would become progressively of less importance. Even though the whole value of these secret processes and know-how might not be lost at once as the result of the agreement, yet their value would be greatly diminished, and it was doubtful whether they would within a measurable period of time have any value at all remaining to the company. On these grounds the House of Lords held that the company had parted with a capital asset, and that the consideration of £100,000, received in return, was wholly a capital receipt.

New Catalogues

Aluminium Pressure-die-castings. Fry's Diecastings, Limited, of Prince George's Road, London, S.W.19, and elsewhere, have issued a 28-page well-illustrated brochure devoted exclusively to die-castings in aluminium alloys. After indicating the wide field which exists for these castings, there is an interesting discussion as to composition, the gist of which is that whilst the Americans favour copper content higher than 2.5 per cent., Fry's Diecastings do not. They recommend LM2 for the general run of castings and LM20 where the better mechanical properties justify the cost. Several pages are allocated to the design of pressure-die-castings, which users would be wise to study carefully. Under the heading of machining, some very helpful data as to speeds and feeds are presented, and another very useful section is given over to the various finishing processes which can be applied to this class of castings. Whilst it is good policy to give information as to the largeness of size of the die castings produced—up to ten pounds weight—it is often good publicity also to talk about the smallest, or any other adjective among superlatives that can be used. Readers who would like copies of this interesting booklet should write to the firm's Midland Works, Brierley Hill Road, Wordsley, near Stourbridge.

Pig-iron. It is quite a long time ago since a brochure covering pig-iron has been received and thus one arriving from the Refined Iron Company (Darwen) Limited, Spring Vale Works, Grimshaw Street, Darwen, Lancs, was especially welcome. The production of the catalogue is excellent, but there is a certain lack of attention to detail which should be corrected in future editions. The stressing of the properties of their brand of pig-iron—Automat—is very well done. The reduction in chill is well set out, where a comparison is made between the firm's brand and ordinary low-phosphorus iron. The lack of detail here is that no magnifications are given for the photomicrographs included. The idea of setting out tool wear as two graphs is good, but again, the import of the abscissae should be designated. The tensile test results are also marred by the use of lb. per sq. in. instead of tons. The last page before the cover is good publicity, as it offers not only service after sales but also the supply of a registered device for use with patterns to indicate the use of this new pig-iron in the making of the castings. Summing up, a really good piece of publicity has lost a little of its value through poor sub-editing.

Alloys and Metals. A quite amusing catalogue called "Product Sketches" has been received from the Alloys Division of Union Carbide, Limited, 103, Mount Street, London, W.1. Especially did the reviewer like the picture of an old-time ironfounder calculating his charges by the pounds per cent. method and his modern counterpart obviously living in luxury. The real object of the brochure, however, is to list the 160 different ferro-alloys the company makes. These are set out under each main element and an indication of general composition is given.

Bogie-hearth Furnaces. A four-page illustrated leaflet received from G.W.B. Furnaces, Limited, P.O. Box 4, Dibdale Works, Dudley, Worcs, covers a batch-type furnace designed, *inter alia*, for the stress-relieving of castings and similar bulky charges. It is of the bogey-hearth type and is heated by electrical elements. Special attention has been paid to thermal insulation and reducing heat losses generally.

British Compressed Air Society

Report of Progress during 1957

At the annual general meeting of the British Compressed Air Society, held last month at the May Fair Hotel, London, the following report was presented:—

Measured in terms of value, 1957 was a most successful year for the British compressed-air equipment industry. Deliveries by manufacturers in the year reached a record figure of over £21,000,000; the value of exports of compressed-air equipment was higher than in any previous year and £500,000 more than in 1956.

With the fall in prices of some primary commodities, affecting capital investment in certain overseas countries, and high interest rates, coupled with tightness of money, restricting building, re-equipment and other programmes in the UK, it would be rash to predict that the achievements of 1957 will be surpassed in 1958. Although complete figures for 1957 are not yet available there are already indications that the rate of expansion of the compressed-air equipment industry is slowing. The trends in the principal sectors of the industry are given below.

Compressors and Exhausters

The value of deliveries of compressors and exhausters by UK manufacturers in 1957 was 11 per cent. higher than in 1956, but this increase was smaller than that for 1956 over 1955, which was 15 per cent. Taking into account changes in prices, the 1957 increase probably represents a net growth of 5 per cent. in volume of output. The rapid expansion in the manufacture of portable rotary compressors is a significant feature, annual production of this item having risen from £80,000 in 1954 to well over £1,000,000 in 1957. The value of orders on hand has been falling since September 1956, and at the year end stood approximately 10 per cent. lower than 12 months earlier. Measured by value, order books are, however, considerably fuller than they were in 1954.

The value of exports has continued to rise—the increase for 1957 compared with 1956 being 7 per cent. The increase for 1956 over 1955 was 16 per cent. Although the UK has been unable to regain the position, which was lost to Germany in 1956, as the second-largest exporter of compressors and vacuum pumps, it is encouraging to note that the UK share of world exports in this equipment is one-fifth of the total. World demand for compressors remains buoyant, although the increase in international trade in this item for 1957 is believed to have been slightly less than that for 1956.

Pneumatic Tools

The value of deliveries by UK manufacturers of pneumatic tools fell in 1957 to a figure slightly below that for 1956. A detailed examination shows that the decrease is attributable to smaller deliveries of spare parts and accessories, rather than to complete tools, the manufacture of which rose slightly in value—although the volume of production probably fell. The fall in orders outstanding, which began in mid-1956 has continued, and order books appear to be little fuller than they were in 1955. Orders outstanding were 20 per cent. less at the end of 1957 than they were at the beginning of that year.

The value of exports of pneumatic tools showed an increase in 1957 over 1956, although not so great as that for the previous annual period—5 per cent. compared with 11 per cent. Exports by UK manufacturers account for nearly one-third of the world trade in pneumatic tools—only Sweden exporting a larger annual value.

Spray Equipment

In the case of paint-spray equipment, the value of UK production in 1957 was 7 per cent. higher compared with 1956—a slightly smaller increase than for 1956 over 1955. Since 1954 growth has been most rapid in the sectors of the industry manufacturing spraying cabinets and exhaust fans, and automatic-spraying equipment.

The value of orders outstanding, in spite of a fall during the first half of 1957, was at the year end slightly above the total value at the beginning of that year. The value of exports has risen in 1957 compared with 1956 by 6 per cent. the increase in the previous annual period being 2 per cent. Although few countries publish trade statistics relating to paint-spray equipment, it is reasonable to assume that the UK share of world export trade in this product is about one-sixth of the total.

Election of Officers

Officers appointed for the year 1958/59 are as follows:—Mr. W. B. Rainbird (Climax Rock Drill & Engineering Works, Limited), as president; Mr. E. A. Martin (Padley & Venables, Limited), as vice-president; Mr. G. F. Davies (Hick, Hargreaves & Company, Limited), ex-officio Council Member (immediate past-president); and Mr. T. C. Hore (Holman Bros., Limited), as honorary technical director.

Agricultural Engineers deny Price Ring

The following letter appeared in a recent issue of the "Yorkshire Post":

Farm Machinery. SIR,—Last week's statement on radio and television by Mr. Richard Lamb, the chairman of the Farmers' and Smallholders' Association, was given publicity in the Press. Mr. Lamb said that one of the reasons for the high production costs of British farmers was the existence of a price ring among manufacturers of argricultural machinery. I will be glad if you will give us space to emphasize that our members operate no price rings either at home or overseas. The industry relies entirely on good workmanship, good delivery, and competitive prices to obtain its outstanding sales figures. The British agricultural engineering industry is among Britain's top 10 exporters. We export more agricultural machinery than any other country in the world. Not only have we beaten off a major attack on our foreign markets by Germany, but the value of our exports to North America, the graveyard of so many British sales efforts, was almost £5 millions in 1957. We are exhibiting at Brussels. No national newspaper, other than the farming papers, has mentioned our exhibit. We receive no form of financial support from the Government. Our record of industrial harmony in one of the best in Britain. To a large degree because of mechanization, British farming employs only 5 per cent. of British man-power compared with an average of 20 per cent. for the rest of Europe.—Yours faithfully, Air Vice-Marshal F. L. HOPPS, C.B., C.B.E., A.F.C., secretary, Agricultural Engineers' Association, Limited, 6, Buckingham Gate, London, S.W.1.

[As the well-being of quite a number of UK founders is bound up with that of the agricultural-engineering industry, it is germane to record this information and congratulate the industry on its success at home and overseas.—Editor.]

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

790,512. Vereinigte Leichtmetallwerke GmbH., Am Nordbahnhof, Bonn on the Rhine, Germany.

Apparatus for the continuous casting of metals. This uses an electro-magnetic alternating field applied to the partially solidified casting.

791,028. International Smelting and Refining Company, 25 Broadway, New York, USA.

Moulds for use in the casting of copper, more especially of large copper-cakes. It is the aim of the invention to prolong the life of metal casting moulds by minimizing cracking of the moulds.

791,175. Wendell Chester Cheney, 404 Sth. Oak Street, Lake City, Minnesota, USA, and M. G. Whitfield, 2 Harvard Street, Garden City, Long Island, New York, USA.

Improvements in and relating to the manufacture of reinforced light-metal pistons. The reinforcement consists of a wire or strand embedded in the piston during casting, the strand projecting beyond the periphery of the piston to locate the reinforcement in the mould. This protruding part, is, of course, removed by machining after casting.

791,381. Feslente, Limited, Leighton Buzzard, Beds, and Leicester, Lovell and Company, Limited, North Baddesley, Southampton, Hants.

In shell-moulding the patentees have found it possible to do away with release agents, such as waxes and silicones, by using in the sand-resin mixture, resin in the form of a thin coating which surrounds each sand particle. For this purpose phenolformaldehyde resin in a potentially thermo-setting condition has been found suitable.

792,133. Erwin Buhrer, 117 Alphenstrasse, Schaffhausen, Switzerland.

It is the objective of the present invention to provide means for making it easier to cast a number of moulds, and, consequently, a number of faultless castings, produced, simultaneously, from a single, pre-determined quantity of material.

792,174. Henry Kremer, 35, Stormont Road, Highgate, London, N.6.

The strengthening of metals by the use of glass fibre is the subject of this patent. The inventor makes reference to the use of glass fibres in the form of a matt to produce castings.

792,323. Rubery Owen and Company, Limited, Booth Street, Darlaston, Staffs, and H. B. Hallsworth, 28, Dickinson Drive, Bescot, Walsall, Staffs.

Improvements to moulding-box devices to expedite the production of castings from moulds prepared by a moulding machine, described, illustrated and claimed in B.P. 723,902.

Russian Steel Output Up

Russian steel output in the first quarter of this year, according to Moscow Radio, was 13,300,000 tons, representing an increase of 7 per cent. over the corresponding 1957 quarter.

Pig-iron output was given at 9,500,000 tons, an increase of 6 per cent., rolled steel 10,600,000 tons (7 per cent. up), and steel tubes 1,100,000 tons (5 per cent. up).

Company News

FOLLSAIN-WYCLIFFE FOUNDRIES, LIMITED—CIC consent has been obtained for a two-for-five scrip issue capitalizing £40,000.

PULSOMETER ENGINEERING COMPANY, LIMITED—The final dividend is raised by 2½ per cent. to 15 per cent., making 25 per cent.—against 22½ per cent.—for 1957 on the £730,000 (£560,000) capital. Group profits, including those of the new subsidiaries from date of acquisition, expanded to £484,805 from £343,186. Net profit rose from £146,541 to £196,075.

DANIEL ADAMSON & COMPANY, LIMITED, engineers and boilermakers, of Dukinfield (Ches)—The company has decided not to increase the 12½ per cent. dividend in 1957, due to present trading conditions and to substantial capital commitments of £164,400 (£107,991). In future years, however, the directors have under review the adoption of a more flexible dividend policy and if profits are maintained or increased, it is hoped an advance in the rate of dividend can be recommended. The net profit for 1957 was £104,654 (£65,849).

Increases in Capital

DENCO ENGINEERING SERVICES, LIMITED, Hereford, increased by £39,900, in £1 ordinary shares, beyond the registered capital of £100.

HUNSLET ENGINE COMPANY, LIMITED, Leeds, 10, increased by £250,000, in £1 ordinary shares, beyond the registered capital of £150,000.

TAY TOOL WORKS, LIMITED, West Bromwich (Staffs), increased by £37,000, in £1 ordinary shares, beyond the registered capital of £8,000.

TUNGSIT ELECTRO-METAL WORKS, LIMITED, London, E.C.4, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

YORKSHIRE ENGINEERING SUPPLIES, LIMITED, Leeds, 10, increased by £196,000, in £1 ordinary shares, beyond the registered capital of £54,000.

BOLTON'S SUPERHEATER & PIPE WORKS, LIMITED, Manchester, 2, increased by £80,000, in £1 ordinary shares, beyond the registered capital of £20,000.

WHITECROFT PIN MANUFACTURING COMPANY, LIMITED, Whitecroft (Glos), increased by £130,000 in £1 ordinary shares, beyond the registered capital of £20,000.

PRECISION TOOL & INSTRUMENT COMPANY, LIMITED, London, W.C.2, increased by £30,000, in £1 ordinary shares, beyond the registered capital of £10,000.

NORTHERN REPAIRS, LIMITED, general and specialist engineers, etc., of Leeds, 10, increased by £14,600, in £1 ordinary shares, beyond the registered capital of £400.

JOSEPH ADAMSON & COMPANY, LIMITED, engineers, etc., of Hyde (Ches), increased by £125,000, in £1 ordinary shares, beyond the registered capital of £105,000.

Swedish Iron and Steel Output

Swedish iron and steel output in the fourth quarter of 1957 was as follows (figures given are in metric tons): Pig-iron 379,200, sponge iron 36,700, wrought iron blooms and rough bar 600, ingot 614,000, finished steel castings 9,600, and billets, blooms and slabs 413,400. Finished steel amounted to 446,500 metric tons distributed as follows: Wrought iron bar 100, forgings 22,200, rails and other railway materials 13,800, girders and beams 8,400, strip 20,700, wire rod 48,000, angles and other sections 24,900, plates and sheets 96,200, seamless tubes and pipes 29,100, other hot-rolled products 149,100, semis for sale 34,000.

A CONTRACT worth $50,000 has been awarded to W. H. Dorman & Company, Limited, Stafford, by the Canadian Department of Transport for the supply of diesel marine propulsion engines. The engines will power landing craft used for taking supplies to isolated communities along Canada's coastlines.

Metallurgical Abstracts

Furnace-Atmosphere Analysers. W. L. BESSELMAN. (*Steel Processing and Conversion.* 1957. Vol. 43; No. 9; pp. 517-25.) The author describes the analysers currently available and their principles of operation. Dew-point analysers have been developed using any one of four generic principles of operation. (1) Change in conductivity of hygroscopic salt compounds. (2) Condensation of water on cooled surfaces. (3) Formation of fog by sudden expansion of compressed gas. (4) Electrolysis of salt compounds or organic liquids. This latter is a new development. The analyser operates on a coulometric principle. The electrolysis cell contains a pair of closely-spaced electrodes across which a suitable d-c potential is maintained. The space between the electrodes is bridged by a film of phosphorus pentoxide which has substantially no electrical conductance. When a moisture-bearing gas stream is passed over the electrodes the gas reacts with the pentoxide to form phosphoric acid, which is a good electrical conductor. Current passes between the electrodes and electrolysis of the water occurs and the oxygen and hydrogen pass with the sample gas. For a constant mass rate of flow of sample gas the current passing between the electrodes is proportional to the concentration of water vapour in the gas stream. The unit is said to be sensitive to a few parts per billion and is adaptable to continuous recording and controlling. Infra-red analysers are a recent development which permit accurate and continuous measurements of CO_2, CO, and CH_4. This can be done in the presence of interfering gases which is not possible with analysers which operate on the thermal-conductivity principle. These analysers operate on the selective absorption of infra-red energy and utilize two fundamentals, namely:—(*a*) Each gas compound absorbs a certain portion of infra-red radiation that no other gas absorbs. (*b*) The amount of radiation absorbed is proportional to the concentration of the gas compound. Extremely high accuracy of measurement is possible. The hot-wire analyser continuously and directly measures the carbon content of the furnace atmosphere. This works on the principle that, at elevated temperatures, the electrical resistance of iron and its alloys changes with the carbon content. Also, analysers are available which measure and control the percentage of total combustibles in furnace or generator atmospheres.

A New Method of Finding Furnace Hot-spots. ANON. (*Steel*, 1957. Vol. 141; No. 7; p. 134.) An instrument, sensitive to temperature changes (less than 2 deg. F.) at three miles, is being used to detect hot spots inside equipment. This instrument, called the "Evaporograph," uses the condensation of oil molecules on a sensitive membrane to picture the intensity of infra-red radiation. Hot spots in blast furnaces can be detected before any significant damage is done. It shows the temperature-distribution pattern as an aid to furnace design. The instrument is portable and can be used for spot checks throughout the plant. It requires no scaffolding or physical contact with the area under study. Blast-furnace stacks are checked from ground level. Worn areas can be detected in machinery, steam lines, and mill equipment, where temperature is a measure of the interior conditions. The vaporizing cell of the instrument consists of a nitro-cellulose membrane, 4 millionths of an inch thick, and mounted on a metal ring. Air is evacuated from the cell, and the rear half is heated slightly to increase the vapour pressure of the oil, which starts to condense on the nitro-cellulose. The image of the object, portions of which will be at different temperatures because of variations in the infra-red radiations, is focused on to the film. More oil condenses on the cooler portions of the membrane. Each temperature-differential area has a different interference colour, resulting from the variable film thickness. There are two methods, namely photographic and visual. In the photographic, the change in film thickness in a given time is measured by making a density scan of the pictures. In the visual method, times are measured for a given thickness as indicated by the change from one colour to another.

"A New Theory Explains Stress-corrosion Cracking." ANON. (*Materials in Design Engineering.* 1958. Vol. 47; No. 1; p. 150.) A new theory which may explain the phenomenon of stress corrosion in metal structures is based on the discovery that minute crystals, resembling delicate plates, tend to grow from the surface of stainless steels when the metal is stressed and exposed to corroding atmospheres. The crystals are described as "sub-microscopic platelets of chromium oxide" and they form on strongly-stressed stainless-steel specimens which are exposed to atmospheres containing traces of negatively charged chlorine atoms. One of the experiments leading to the theory involved subjecting a small piece of stainless steel wire, 0.009-in. dia., to a carefully controlled atmosphere of oxygen and water vapour at 593 deg. C. After corrosion by the hot atmosphere the wire was examined and photographed with an electron microscope.

A typical sample was found to erupt with millions of oxide whiskers. Only about one or two millionths of an inch in thickness, these whiskers grow to a height of 300 to 400 times their diameter. Their density is about 6,000 million per square inch of metal surface. Changes occur when a sample is pre-stressed and a trace of chloride ions (less than 5 parts per million) is added to the atmosphere. Instead of long, thin filaments, rows of thin, upright, parallel plates grow along a definite crystallographic direction. Their thickness is 0.00005 in. or less. Analysis shows them to have the characteristic structure of an oxide of chromium; each tiny plate appears to be a single crystal of chromium oxide. The knowledge that chloride ions stimulate growth of crystals in strongly-stressed metal, and that these crystals tend to crack the metal and lead to ultimate failure may enable research workers to prevent such failures.

News in Brief

IMPERIAL SMELTING COMPANY, LIMITED, has had plans prepared for the construction of a new smelting plant at Swansea Vale Works, Llansamlet, Swansea, South Wales.

CENTRAL FOUNDRY, LIMITED, of Bridgetown, Barbados, B.W.I., have been appointed sole agents in Barbados for the sale and service of Leyland, Albion and Scammell vehicles.

IN FACE OF STRONG COMPETITION from home and abroad, Hunslet Engine Company, Limited, of Jack Lane, Leeds, have secured from the Madras Port Trust an order for four 274 h.p. diesel-hydraulic locomotives.

A NEW COMPANY, created by the Leylands Motors group, has been registered as Leyland Albion (Central Africa) Limited, with an authorized capital of £500,000 and an issued share capital of £250,000. The registered office is at Salisbury.

THE 1958 CHEMICAL ENGINEERING AND METALLURGY EXHIBITION, organized by Studieselskapet for Norsk Industri, is to be held in Oslo from October 15 to 26. Study conferences are also being arranged in conjunction with the exhibition.

Mr. H. GILBERT RAMSELL, general manager of the British divisions of the Yale and Towne Manufacturing Company, presented gold watches to 15 employees, with 25 years' service and over, at a ceremony held at the Willenhall works of the company on April 21.

THE WORKS of Thos. Firth and John Brown, Limited, were toured by the Lord Mayor of Sheffield, Alderman A. Ballard, on Monday April 21, at the beginning of the works' "Good Housekeeping" week. On Monday and Tuesday evenings the works were visited by wives and families of employees.

THE FIRST Arthur Hughes Apprenticeship Prize, inaugurated by Kelvin & Hughes, Limited, instrument manufacturers, etc., of Barkingside (Essex), has been presented to Mr. R. W. Barker. The prize is named after Mr. Arthur Hughes, late managing director of the family business of Henry Hughes & Son, Limited, now part of Kelvin & Hughes.

"FIRTH BROWN: A TOUR OF THE WORKS," the film recently produced by Thomas Firth and John Brown, Limited, will be seen by Members of Parliament on May 14 at a film show arranged in the House of Commons by Mr. R. E. Winterbottom, M.P. for Brightside, Sheffield. The Sheffield Libraries' centenary colour film, "Books in Hand," will also be shown.

VISITORS TO THE NATIONAL MARITIME MUSEUM at Greenwich, where exhibitions are now being staged to commemorate the bicentenary this year of the birth of Nelson, can see the large medals which Matthew Boulton made and presented to all those who took part in the Battle of Trafalgar. The medals, struck at the Soho Foundry, show Nelson's portrait and a view of his ships.

SIR FRANK SOSKICE, Q.C., M.P., former M.P. for the old Neepsend Division of Sheffield, will open an historical exhibition, arranged by Sheffield Trades and Labour Council as part of its centenary celebrations, at Sheffield Central Library Civic Information Centre on Saturday, April 26. Exhibits include working models, photographs and documents of Sheffield work and craftsmanship over the last 150 years.

IN PURSUANCE of the company's export drive, Mr. W. B. Lane, managing director of Rapid Magnetic Machines, Limited, Lombard Street, Birmingham, is flying to the Middle East and will be visiting Greece, Turkey, Israel and Cyprus. This business trip follows quickly on his world tour when he visited the company's representatives in India, Ceylon, Singapore, Australia, New Zealand, USA, and Canada.

ENGLISH STEEL CORPORATION, LIMITED, are holding their export conference at Harrogate and Sheffield between May 2 and 8, when overseas agents will be present and hold discussions with executives of the various branches of the group. On the final day in Sheffield, there will be a reception at the Cutlers' Hall by the Master Cutler, Sir Frederick Pickworth, who is chairman of the group, and will preside at the final dinner.

CHARLES P. KINNELL & COMPANY, LIMITED, are to cease production at their Vulcan Iron Works, Thornaby-on-Tees and the foundry will close on April 25 after 60 years of production. Mr. J. Lindsay Kinnell, managing director, said in a statement that the decision had been made because it was no longer economic to produce the required castings there—one of the reasons being heavy transport costs. The company will continue in its trading activities and production will be transferred to a foundry nearer the company's London head office and works.

A NEW RADIO-ASTRONOMY STATION at High Bradfield, near Sheffield, is to be operated by Sheffield University. It will be used mainly for a continuous study of a 1,000-mile belt of the upper atmosphere and also available to observe man-made satellites. The aerial equipment covers seven acres of moorland and the radio telescope is supported on 10 masts, each 78-ft. high. The research work at the station by the University's Department of Physics will be part of the University's contribution to the International Geophysical Year.

THE ANCIENT BLAST FURNACES at Morley Park, near Belper, Derbyshire, may be officially preserved as historical monuments. The furnaces, constructed by Francis Hurt, of Alderwasley Hall, in 1780 and 1818, are thought to be the first in the county ever to use coke, and records show that in 1808 the earlier one produced 700 tons of pig-iron. In the shape of sawn-off pyramids, they are 30-ft. sq. at the base and 30-ft. high. Cylinder bellows worked by steam engines provided blast, and the process from "full blast" to tapping-out took 12 hours. The pig used was 3½-ft. long and weighed 300 lb. All trace of a foundry formerly in the park has gone.

Mr. ALEX RUSSELL, who has been secretary of Dundee and district branch of the Foundry Workers' Union for 13 years, is to resign his post as a protest because his national executive did not officially back a "save the foundries" campaign in Dundee. A few weeks ago he organized a campaign in an attempt to keep open three foundries which the engineering firm of Urquhart Lindsay and Robertson Orchar, Limited, had announced were closing. Despite meetings, demonstrations and appeals to the Scottish Secretary and Dundee Town Council, the attempt to keep Wallace, Townsend and Bellfield foundries going, failed. Two hundred workers, including Mr. Russell, were paid off and the foundries closed a fortnight ago.

Mr. A. L. N. STEPHENS, National Director of the Institute of Personnel Management, addressed the Sheffield branch of the Institute on April 17, on the employment of coloured workers in this country. He said the "uncle" system had operated in factories where coloured people were employed and where, because of the language difficulty, English-speaking coloured men were authorized to take on more men.

During the two-year Birmingham inquiry into that city's coloured problem, he had heard of instances where the "uncle" received more than £1 a week from coloured men as a guarantee of their job. Mr. Stephens said that the coloured people had themselves expressed disappointment at the "second-class" jobs open to them, and they were very sensitive about colour prejudices.

LOCAL OFFICIALS and others, including the Mayor-elect (Councillor F. R. Hunter) were present at the foundry of John Taylor & Company, Loughborough, Leics, on the afternoon of April 15, to watch the casting of the 8 cwt. bell that will be presented to Loughborough's "twin town" of Epinal in the Vosges district of France. The bell, which is decorated and bears the crests of Loughborough and Epinal, will be presented to Epinal in June by a civic delegation from Loughborough, headed by Councillor Hunter, who will then be Mayor. The present Mayor (Alderman L. T. Tyers) stirred the molten metal with a rod during pouring and as he was doing so Mr. Paul Taylor, principal of the foundry business, said: "If there's anything wrong with the bell when we look at it next Monday it will be the Mayor's fault."

NATIONAL SAVINGS CERTIFICATES were presented on April 17 to 21 employees of the iron foundry of H. & J. Hill (Willenhall), Limited, and its subsidiary George Dyke & Sons, Limited, drop forgers, to mark over 25 years service. The employees also received gilt-printed certificates from the management. The 21 had nearly 750 years service between them. The longest serving is foundry foreman, Mr. Albert Roberts, who received a gold watch for 50 years. Following Mr. Roberts in service came Mr. Tom Morgan with 49 years service. Several have been in the foundry for over 40 years, including Mr. Dick Edwards, patternmaker, Mr. Leslie Forrest (foundry foreman) and Mrs. R. Richards (bookkeeper). The presentations were made by Colonel C. A. B. Lindop, chairman of the company, and Mr. J. H. Bingley, managing-director, presided.

Mr. KENNETH J. MORRIS, Deputy Premier of Queensland, Australia, and Minister for Labour and Industry, led the delegation of seven Australian businessmen who visited Birmingham on April 15 for some days' stay there. The party was entertained to luncheon by the Birmingham Chamber of Commerce. Speaking at the luncheon, Mr. Leon Trout, chairman of the Association of Chambers of Commerce of Australia, and deputy leader of the delegation, said that recent discoveries of uranium, and what may prove to be the largest deposits in the world of bauxite in Northern Queensland, had brought the realization that the State must encourage expansion of existing industry and development of other manufactured products. "We are in the same position in Queensland that America occupied 50 years ago, but not sufficient thought is being given outside our state to what our position in the world may be in 50 years' time," Mr. Trout said. Later, speaking at the Birmingham Exchange and Engineering Centre, he said "We regard the United Kingdom as the holding company and ourselves as one of your subsidiaries." No restrictions would be placed by the State Government on investment he added. Asked what kind of industries Queensland wanted, Mr. Morris said that they were most interested in iron and steel but would also welcome light-metal industries. He disclosed that as a result of a visit to a west country metal firm he had telegraphed his Government asking that a director of a Queensland company should come to England immediately to discuss the possibility of a factory being opened by the British concern. During its stay in the Midlands the delegation visited factories in Wolverhampton, Smethwick and Tipton as well as Birmingham.

Brown Bayley Group Report

The accounts for Brown Bayley, Limited, Sheffield, for the period ending December 31, 1957, are in respect of five months, but figures for the subsidiary companies of the group are in respect of 15 months, states Mr. J. W. Garton, chairman of the parent company in the directors' report and accounts issued last week. Owing to this anomaly it should not be inferred that the amounts which may be distributed in respect of the current financial year will necessarily be any the greater, states the chairman. The holding company's dividend for the five months is 10 per cent. from a profit of £151,842.

Of the subsidiary companies, the Hoffmann Manufacturing Company, Limited, had a successful year, its turnover reaching a record level. The accounts of this company reached a record level. " dvbgkqj xzfiflffffi company show a net profit, after tax and depreciation, of £647,026, which compares with £548,277 in 1956. The amount distributed by way of ordinary dividends is £175,000, compared with £125,000 in 1956.

Brown Bayley Steels, Limited, for the 15 months' period shows a net profit after charging depreciation and tax, of £458,975, and the amount distributed by way of dividends is £94,875, compared with £62,100 for 1956. The rate of dividend paid for the 15 months is 13¾ per cent., less tax, and on the basis of this rate the effective rate for a full year would be 11 per cent., less tax, which compares with the 9 per cent. less tax, in respect of the 12 months ended September 30, 1956.

Death of John G. Buchanan

The death occurred on Tuesday, at the age of 88, of Mr. John Gray Buchanan, a director and former chairman of William Jacks & Company, Limited, iron, steel and metal merchants, of London. It was but six years after the inception of the company that Mr. Buchanan joined the firm's Glasgow office. After experience in the Glasgow pig-iron and steel markets, he was appointed private secretary to the late Dr. William Jacks, who was M.P. for Stirlingshire, in 1893. When the company started in London in 1901, he became manager and a partner. He was for many years a director of the Expanded Metal Company, Limited, West Hartlepool.

In the ensuing years, Mr. Buchanan was actively associated with the capital's institutions—he was a member of the Council of the London Chamber of Commerce from 1918, serving as deputy chairman in 1923/24 and treasurer from 1926 to 1929, and chairman of the Iron, Steel Tinplate and Metal Merchants' section from 1918 to 1920. He was a member of the Board of Referees for the Treasury and served as a member of the Advisory Committee to the department of Overseas Trade from 1922 to 1927. Mr. Buchanan was a member of the Advisory Committee of the Commission on Imperial Mineral Resources and of the British Standards Institution concerned with metals. He was formerly treasurer of the benevolent fund of the London Metal Exchange, of which he was one of its oldest members. In December, 1956, he retired from the chairmanship of William Jacks & Company, but retained his directorship.

IT WAS REPORTED in the JOURNAL last week that Mr. A. G. B. Owen, chairman and joint managing director of Rubery, Owen & Company, Limited, had been re-elected president of the Midland branch of the National Union of Manufacturers, whereas it was his election to the presidency which should have been announced.

Personal

Mr. H. KIRMAN has retired from the board of Baker Perkins, Limited.

Mr. H. PICKARD has been appointed a director of the A.P.V. Company, Limited.

Mr. S. C. TYRRELL and Admiral R. S. WARNE have been appointed joint managing directors of Ransomes & Rapier, Limited.

Mr. R. F. FARMER, assistant secretary of the Incorporated Plant Engineers since 1952, has been appointed secretary in succession to Mr. HADLEIGH S. SEABORNE.

Mr. GEORGE FARLEY, who has been actively associated with Evaporators, Limited, Bognor Regis, since its inception in 1955, has been appointed to the board of the company.

Mr. JOHN LEWIS, who held the position of cashier for more than 26 years at Thos. W. Ward, Limited, Albion Works, Sheffield, has retired after 54 years' service with the firm.

Dr. L. L. Ross has been appointed deputy managing director of Elliott Brothers (London), Limited. Rear-Admiral Sir ALEXANDER D. MCGLASHAN and Mr. J. E. O'BREEN have been appointed directors of the company.

Mr. MALCOLM A. CURRY, general manager of the A.B.C. Coupler and Engineering Company, Limited, has been elected to the board as joint assistant managing director. Mr. D. B. ASHWORTH retired from the board by rotation, but did not seek re-election.

Mr. R. W. C. REEVES, a director of Johnson & Phillips, Limited, has been appointed director and general manager of the company. Mr. Reeves joined the company in 1924 and was appointed to the board in 1943. Sir RICHARD ERNEST YEABSLEY also has been appointed a director of the company.

The appointment is announced of Mr. R. LAROUX HANDLEY, of Ferranti, Limited, as president of the National Ironfounding Employers Federation. He has also been elected vice-chairman of the National Federation of Engineering and General Ironfounders, of which Mr. C. J. GRAZEBROOK, of Grazebrook Foundry, Limited, Dudley, Worcs, is the new chairman.

Mr. MALCOLM J. GLENNY, has been elected chairman of the Council of Ironfoundry Associations in succession to Mr. N. P. NEWMAN, who has held the office for some 10 years. Mr. Newman remains president of the Joint Iron Council, which comprises the Council of Ironfoundry Associations and the Council of Iron Producers—the latter representing the associations of foundry pig-iron producers.

Mr. N. D. G. ROBERTSON, who has been managing director of the Non-Ferrous Die Casting Company, Limited, since the company's inception, has resigned from the board, but will continue to act in the capacity of consultant. His son, Mr. N. D. G. ROBERTSON, has been appointed to succeed him as managing director and Mr. G. C. PRAILL has been appointed a director of the company.

As from May 1, Mr. S. G. P. DE LANGE relinquishes his responsibilities as commercial manager of the industrial products division of Philips Electrical, Limited, and in view of his long experience, is appointed adviser to the company and co-ordinator in all matters affecting industrial products. With effect from the same date, he is succeeded as commercial manager by Mr. C. W. V. DAVIS, at present manager of the filtration department.

Mr. G. B. PARTRIDGE, development officer, and Mr. R. BICKLEY, special products superintendent, of William Mills, Limited, aluminium-alloy founders of Wednesbury, left by air for America on April 11. They will study the latest technical advances in the American aluminium-alloy-casting industry. William Mills, Limited, is part of the British Aluminium group which owns a primary aluminium production plant in Canada with, it is stated, a potential capacity of about two thirds of UK consumption of aluminium ingots.

Mr. E. G. BOISSIER, deputy-chairman and general manager of Aiton & Company, Limited, Derby, has retired from the position of general manager, but will continue as deputy-chairman. He has been connected with the firm since 1914. Mr. D. J. T. OUTTRIM, a director of the firm has been appointed general manager. Mr. J. W. RAWLINGS, commercial manager, and Mr. C. F. MORRIS, Manchester office manager, have both retired on reaching retiring age. Mr. P. W. PEARSON, who has been with the company for 23 years, has been appointed to Manchester.

Vickers, Limited, announces the following changes in the group's organization:—Mr. J. H. ROBBIE has been appointed a director of Vickers-Armstrongs, Limited. Mr. E. P. TOMLINSON has been appointed Limited, in place of Mr. ROBBIE. Mr. A. LAWRENCE commercial director of Vickers-Armstrongs (Engineers), COOPER has been appointed secretary of Vickers in succession to Mr. Tomlinson, and Mr. J. MCLEAN has been appointed deputy secretary. Mr. Tomlinson is succeeded as secretary of Vickers-Armstrongs by Mr. McLean and as secretary of the aircraft, engineers, shipbuilders and tractors subsidiaries by Mr. T. P. HOUGHTON. Mr. T. C. RAYMOND is appointed a special director of Vickers-Armstrongs.

Following on the purchase of ordinary shares of Hurst, Nelson & Company, Limited, wagon builders, Motherwell, by Charles Roberts & Company, Limited, Yorkshire, the board of directors of the former company—in accordance with the conditions of the offer—has been reconstituted. The two joint managing directors, Mr. JOHN T. MCINTOSH and Lt.-Col. ARTHUR N. FORMAN, have resigned, while Col. GEORGE E. G. FORMAN has resigned from the board. Mr. DUNCAN BAILEY, Mr. RUSSELL BAILEY, Mr. JOHN HENSHAW, and Mr. S. A. A. KNOTT (all directors of the English company) have been appointed directors of the Motherwell undertaking. Mr. JAMES WADDELL, secretary, will continue as a director of Hurst Nelson & Company. Mr. McIntosh received a barograph from the staff to mark his retirement. Three years ago he was elected chairman of the Scottish Council of the Federation of British Industries.

Obituary

Mr. LOUIS EDWARD FLINT, head of Flint & Bates, Limited, constructional engineers, Mansfield, Notts, has died at the age of 63. The firm was founded by his father in 1924.

Mr. HENRY NELSON ALLDAY, joint managing director of J. Betts & Sons, Limited, smelters and refiners of Hockley, Birmingham, died on April 10. He had been with the firm for more than 50 years and became joint managing director about five years ago.

Mr. WILLIAM JOHN GOLDSWORTHY SPERRYN, a director and secretary of Sperryn & Company, Limited, brassfounders, of Birmingham, died on April 9 at the age of 75. He entered the family foundry business in 1899 and retired from the position of managing director 10 years ago. He was a former president of Birmingham Rotary Club.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

DURSLEY, GLOS., May 12—Construction of approximately ¼-mile of 5-in. cast-iron rising main, together with other works incidental thereto, at Coaley, Contract No. 4, for R.D.C. Documents from the engineers, A. P. T. Cotterell and Son, 54, Victoria Street, Westminster, S.W.1. Deposit £3 3s. Plans also seen at Council Offices, Kingshill, Dursley.

CARMARTHEN, May 5—St. Ishmael water augmentation scheme, on fixed price basis, for R.D.C., *viz.*, supplying, excavating for, laying, jointing, maintenance a.1 ancillary work of approximately 8,300 lin. yd. of 4-in. dia. spun-iron pipes with flexible or lead joints, and 1,550 lin. yd. of 3-in. dia. spun-iron pipes with flexible or lead joints. Documents from John Jones, clerk to the Council, Rural District Council Offices, Spilman Street, Carmarthen. Deposit £3.

ENNISKILLEN, FERMANAGH, May 2—Chanterhill-Killyvilly and district water supply scheme, for R.D.C. Provision and laying of approximately 1,150 yd. of 8-in. Class C cast-iron pipes, 740 yd. of 8-in. Class B cast-iron pipes and 150 yd. of 3-in. Class B cast-iron pipes, together with ancillary works. Documents from Walter Megaw, clerk of the Council, Council Offices, Cornagrade, Enniskillen. Deposit £5 5s.

STAFFORD, May 7—Tenders are invited from responsible contractors for the provision and laying of about 10,400 yd. of 4-in. and 3-in. dia. spun-iron pipe water mains with screwed gland joints, in the Parishes of Salt and Enson, Hopton and Coton, and Sandon. Plans, specifications, etc., may be seen at the offices of the Council's Consulting Engineers, Elliott and Brown, Stanley House, Pelham Road, Nottingham, and copies of the Quantities and Form of Tender may be obtained from them on deposit of five guineas (by cheque payable to the Stafford Corporation).

AUSTRALIA, May 29—Scales and weights. (ESB/9006/58.)

THAILAND, May 26—Sewing machines. (ESB/9446/58/ICA.)

CUBA—Lamadrid y Gonzalez, Ingenieros Importadores, S.A. P.O. Box 2131, Havana, are interested in obtaining from the UK 252-1,500 h.p. mechanical-drive and power-generating turbines. (ESB/3738/58.)

SOUTH AFRICA, July 18—Bogie-hearth furnace. (ESB/8893/58.)

CEYLON, May 12—Wood and metal working machinery, and hand tools. (ESB/8783/58/ICA.)

PORTUGUESE EAST AFRICA—Boror Comercial, Caixa Postal 4, Lourenco Marques,, are interested in acting as sole representatives of UK manufacturers of heavy equipment, such as railway locomotives, trucks, railway port equipment, cranes and road machinery. (ESB/8860/58.)

VIETNAM, May 1—Textile machinery. (ESB/8861/ICA.)

INDIA, May 19—Woodworking machinery and machine tools. (ESB/8817/58/ICA.)

BAHRAIN—Middle East Traders, P.O. Box 311, Bahrain, wish to receive quotations for cast-iron soil pipes and rainwater pipes and fittings. (ESB/8760/58.)

Forthcoming Events

APRIL 28

Institute of British Foundrymen

Sheffield and district branch:—Annual general meeting, followed by "Mould Drying," by W. J. Colton, at the Grand Hotel, Sheffield, 1.

APRIL 30

Institution of Mechanical Engineers

Industrial administration and engineering production group:—Discussion—"Means of Increasing Production in Drawing Offices," 6 p.m., at 1, Birdcage Walk, Westminster, London, S.W.1.

MAY 1

Institute of Metals

General meeting:—All-day symposium on "Advances in Inspection Techniques as Aids to Process Control in Non-ferrous Metals Production," at 17, Belgrave Square, London, S.W.1. In the evening a Jubilee Banquet will be held at Grosvenor House, Park Lane, London, W.1.

Southampton Metallurgical Society

"Modern Metallographic Techniques," by M. A. Haughton, M.A.Sc., 7.15 p.m., at the Southampton University.

MAY 2

National Society of Master Patternmakers

Annual dinner/dance at the Strand Palace Hotel, London, W.C.2, and on May 3, annual general meeting, 9.30 a.m., at John Adam House, Adelphi, London, W.C.2.

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SLIP-OFF FLASKS

- One flask does the work of many conventional moulding boxes
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Raw Material Markets

Iron and Steel

For most grades of pig-iron, production keeps ahead of demand. Only in the low-phosphorus irons is the usage approaching output. Although imports of basic steelmaking pig-iron are on a considerably reduced scale, there are still some tonnages being received against uncompleted contracts. The steelworks, however, no longer have to rely on these consignments for their consumption requirements, as home furnaces can satisfy their needs. Good stocks are held by steelworks and current deliveries adequately meet consumption and stock requirements.

Producers of other foundry grades and hematite are not receiving enough orders to enable them to dispose of output. Demand for the high-phosphorus pig-irons continues moderate, there being no sign that seasonal influences will bring improvement, and makers are finding it necessary to add to stocks. Makers are thus enabled to accept additional orders for shipment overseas when these can be obtained against keen competition. Hematite pig-iron continues plentiful and refined irons are readily obtainable. Only the minimum of stocks are being held by the foundries, this applying to all raw materials. Buying is confined to cover consumption and a small working stock, there being very little forward booking as suppliers can deliver promptly from stock.

The extent of demand for pig-iron indicates the amount of business on hand at the foundries. The engineering and speciality foundries are the most favourably employed and those supplying castings to the motor vehicle trade are well provided with work. Demands for high-duty castings for many other trades also keep many of these foundries busy, but the machine-tool industry's requirements have fallen off and some of the foundries catering for that trade are quieter now than for a long time.

Supplies of scrap are good and most foundries have adequate stocks which can be replenished as required. Foundry coke deliveries are satisfactory, and ganister, limestone, and firebricks are adequately available.

The reduced price of billets is not expected to influence demand for billets or the expansion in the call for finished products. Most of the re-rollers are short of work—particularly for small bars and light sections—and the demand for the larger sizes has declined further. Many of the mills have difficulty in making up a rolling programme and have had to resort to short-time working. Unless business improves some firms may have to lay off some employees.

Non-ferrous Metals

Those who hold the view that the price of copper has bottomed may have taken recent events as confirmation of their belief. The strike at Chuquicamata —now in its fourth week—is a major factor in keeping prices steady. The fact that the strike is apparently no nearer solution now than when it started is, too, a bullish influence. The loss of copper metal involved is in the region of 14,000 tons. This has prompted Anaconda to invoke the *force majeure* clause in its contracts.

On the other hand, this situation has given rise to the report that Anaconda is prepared to ship copper to Europe from its stockpile to offset the loss. But, in the absence of any broadening of demand in Europe, no action seems to have been taken in this regard.

More indicative of the strong undertone in copper is the way in which the quotation remained firm in the face of the news that the voluntary production cutbacks in the United States have failed to bring production and consumption into line. Indeed, figures released last week showed that the output in the US for March was 5,000 tons higher than in February; domestic deliveries were some 15,000 tons lower. Accordingly, US stocks now stand at their highest level for nearly 20 years. Nor is the position that US stocks increased by 37,400 tons in March made more palatable by the decline in world stocks at the end of March by some 14,000 tons.

This would appear to be the view taken by the US producers and Kennecott Copper has announced a further cutback of 3,350 tons per month; this brings the company's output capacity down to 67 per cent. of last year's. Meanwhile, the producers' price is unchanged at 25 cents and the custom smelters' quotation at 23½ cents a pound.

Although the tin market has been subject to some selling, requiring the buffer stock manager to intervene to maintain the floor price of £730 a ton, the market is relatively steady. The outlook is for the large tonnages, made available to the market since the beginning of the present quota period, to dry up and the price to rise well clear of the support point. The next meeting of the International Tin Council is on Tuesday, when it is thought the workings of the restriction scheme will be reviewed. While it is believed that the buffer stock manager is now dipping into the special fund established at the last meeting of the council, it is unlikely that quotas of producing countries will be increased. On Tuesday the council announced that more funds have been placed at the disposal of the buffer stock manager to enable him to continue supporting the market price at £730. The size of the special fund has not been revealed. In the US the market, though quiet, is attracting more interest and the price has risen to 93 cents a pound.

Lead continues dull and featureless. The question of the imposition of tariffs is under discussion and it has been reported that the US Government may prefer to resume stockpile purchases rather than impose the duties. This rumour helped the market to maintain a firm appearance. In the US trading is at a very low ebb, but the quotation still stands at 12 cents a pound.

The resumption of stockpile purchases in preference to the imposition of tariffs also acted favourably on zinc. There was not much else favourable to the metal. In the US the output for March was 4,000 tons higher than in February and stocks on that side of the Atlantic showed a gain of 14,500 tons. The US price is 10 cents a pound.

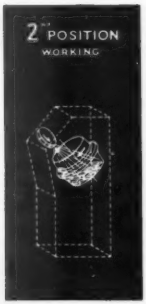
Bruce Peebles' Progress

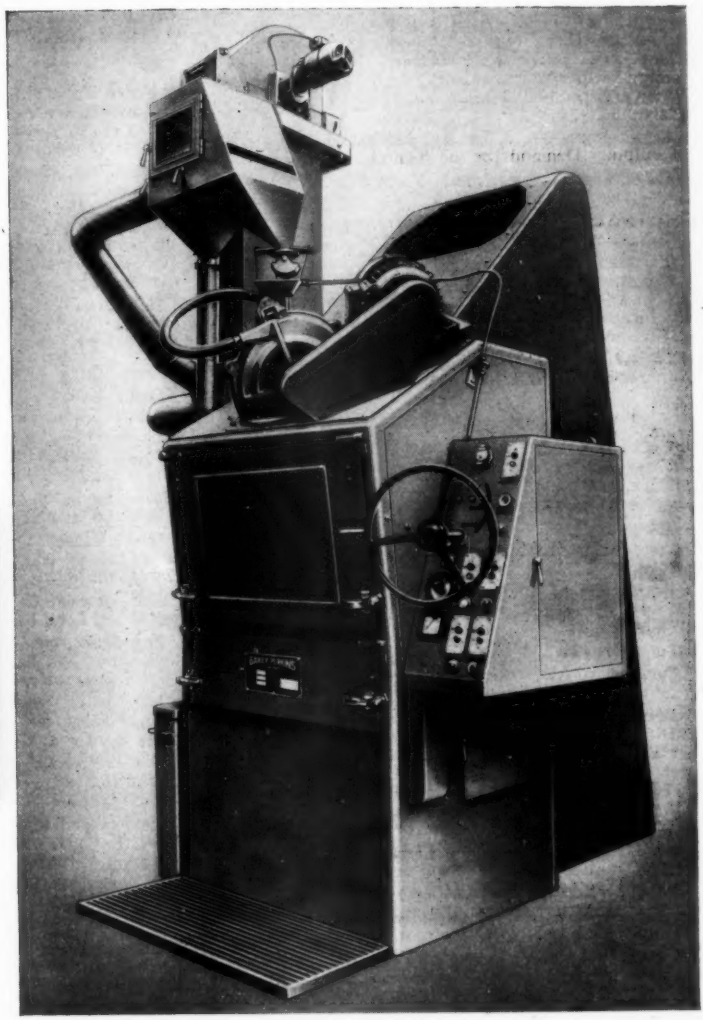
Mr. George Henderson, sales director of Bruce Peebles & Company, Limited, Edinburgh, last week addressed the members of the local City Business Club and told them the story of the firm's growth and accomplishments. He revealed that the company had now between 1,500 and 2,000 men and women on the pay-roll and had approximately £5,000,000 worth of orders on hand, but he added: "During the past 10 years I have no recollection of any Edinburgh business man paying a visit to our works."

The firm was founded in 1903 by the brothers Carmichael, Arthur and John Peebles, who started in a workshop in Leith. The following year they moved to their present site in East Pilton, where they constructed their factory just outside the then Edinburgh boundary—hoping to enjoy the benefits of lower county rating!

BAKER PERKINS Shot Blast Equipment

Rotating Barrel Shot-Blast Machine





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Engineers
WESTWOOD WORKS – PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 23, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 10s. 0d. to £48 0s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £67 0s 0d. to £67 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £187 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 1d. to 1½d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 2½d. to 7s. 9½d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £282 0s. 0d.; 96/98 per cent., £315 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 20s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £174 0s. 0d. to £174 5s. 0d.; three months, £176 5s. 0d. to £176 10s. 0d.; settlement, £174 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 8½d. per lb.; rods, 202s. 3d. per cwt. basis; 20 s.w.g., 235s. 6d. per cwt.

Tin.—Cash, £730 10s. 0d. to £731 10s. 0d.; three months, £730 0s. 0d. to £731 0s. 0d.; settlement, £731 0s. 0d.

Lead (Refined Pig).—Second half April, £72 10s. 0d. to £72 15s. 0d.; second half July, £73 0s. 0d. to £73 2s. 6d.

Zinc.—Second half April, £62 7s. 6d. to £62 10s. 0d.; second half July, £62 15s. 0d. to £62 17s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £96 2s. 6d.; rolled zinc (boiler plates), all English destinations, £93 17s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £83 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 4¾d. per lb. sheets to 10 w.g., 154s. 3d. per cwt.; wire, 2s. 3d.; rolled metal, 154s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £129; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £167; HTB2 (38 tons), —; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £154; LG3 (86/7/5/2), £165; G1 (88/10/2/½), £222; (88/10/2/1), £215.

Phosphor Bronze.—BS1400, PB1 (AID released), £240 per ton.

Phosphor Bronze Strip, etc.—Strip, 229s. 3d. per cwt.; wire, 3s. 6d. per lb.; rods, 2s. 9¾d.; tubes, 2s. 9¾d.; chill cast bars: solids 2s. 10½d.; cored 2s. 11½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 9¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 8¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. to £77 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £201; AB2, — .

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Publication Received

BCIRA Journal of Research and Development, Vol. 7, No. 4. Published by the British Cast Iron Research Association, Alvechurch, Birmingham.

This issue contains three reports. The first is from Mr. R. Barton, on "Cast Iron for Glass Moulds," who has summarized his work in the following statement:—

The composition and microconstituents of cast iron are outlined. The principal properties required in cast iron used as a material for glass moulds and the effect of changes in composition and structure on these properties are considered. A specification for glass-mould iron which accommodates as many of the desirable properties as possible is put forward. It seems probable that a straight unalloyed iron with a composition of the order of total carbon 3.4 to 3.6, silicon 1.8 to 2.2, sulphur 0.12 max., manganese 0.45 to 0.8, and phosphorus 0.4 max. per cent., has served the general purposes of the glass industry as satisfactorily as the more elaborate irons. The mould faces should be chill cast to prevent flakes of kish graphite from reaching the working surface, which give rapid breakdown to penetrating oxidation. A number of suggestions are made for experimental work which might be profitably undertaken to improve the quality of glass-mould irons.

Finally, an account is given of a number of problems submitted to the Association on glass-bottle moulds: these concern surface crazing, heat-treatment, and pitting of moulds.

It may be of interest to comment that during a visit to a large bottle-making factory, the reviewer was told that the iron must have a modicum of malleability, as by constant opening and closing, wear caused flash to appear. The life of a mould could be prolonged if better closing could be effected by pruning the edges.

Mr. A. G. Fuller has made the following summary of his work on "Further Studies on Some Factors Influencing Sinking under Bosses on Thin Plates: The Role of Nucleation."

Studies have been made of the effect of manganese, sulphur, inoculation with ferro-silicon, superheating temperature and furnace holding-time upon sinking. The results of this work have shown a relationship between the degree of nucleation of the melt (as determined by eutectic-cell counts) and sinking. Factors such as decreased superheating temperature or inoculation, which increase the nucleation of the melt, promote sinking. Sulphur in cast iron has been shown to have a nucleating influence, whereas the effect of manganese appears to be due to the progressive neutralization of sulphur.

The final report—No. 479—is by Mr. R. I. Higgins and Dr. J. C. Billington who have given a synopsis of their work in the following statement:—

The production of low-phosphorus foundry iron from U.K. iron ores has been investigated with the aim of developing a dephosphorization process for direct blast-furnace metal. Any practical process entails a virtually complete removal of the silicon and the removal of at least some of the manganese. The extent to which carbon is removed varies from process to process, the indications being that the oxygen top-blowing process is particularly suited to the retention of carbon during dephosphorization.

Small-scale laboratory tests, using 175 lb. of metal, have established the conditions that minimize carbon loss during dephosphorization by the oxygen top-blowing process. Independent trials, using 2 to 25 tons of metal, have confirmed the conclusions drawn from the small-scale tests, and suggest that, at best, 1 per cent. C will be lost for every 1 per cent. P removed by the top-blowing process in a stationary vessel. Since a removal of at least 1 per cent. P is generally desirable, it is concluded that some recarburization of the treated metal will always be necessary, and that unless the use of the top-blowing process facilitates this operation it must compete with other dephosphorization processes solely on economic grounds.

It has been shown that molten iron containing sufficient superheat can be extensively recarburized by cold coke-breeze in a high-speed rotary vessel. Production-scale trials have been made in which 27 tons of metal were dephosphorized and recarburized in the same Kaldo converter. The effect of these processes on the residual elements is mentioned and the advantages of carrying out the recarburization in a separate vessel are discussed.

Technically, the problem of producing low-phosphorus foundry iron from U.K. irons can be solved by dephosphorizing blast-furnace metal by any process that leaves sufficient superheat in the treated metal, followed by extensive recarburization in a high-speed rotary vessel. The Kaldo converter is shown to be suitable for both these processes. Silicon (and manganese, if necessary) can be replaced by ferro-alloy additions after the recarburization treatment.

Book Reviews

Kempe's Engineers' Year-book, 1958 (two volumes carried in a container box). Published by Morgan Brothers (Publishers) Limited, 28, Essex Street, Strand, London, W.C.2; price 85s. post free.

A superficial examination of these two well-indexed volumes does not reveal much new material, yet the publication does change substantially with every edition. To appreciate this evolution, one should compare this, the 63rd edition, with say the 50th. This would give a true appreciation of the meticulous care given each year to ensure reliability and the inclusion of newly arising material. Mr. B. W. Pendred, the Editor, informs readers in his preface that the sections dealing —*inter alia*—with welding and cutting; iron and steel; non-ferrous metal and alloys; and foundry practice, have been changed, revised or added to in some way. A suggestion from the reviewer for next year's issue is the inclusion of information covering some of the more recent developmenst in patternmaking. This is made because the book is full of information on processes not met with in day-to-day work, but which may crop up a few times in an engineer's career.

V. C. FAULKNER.

General Galvanizing—A Manual of Good Practice. Published by the Hot Dip Galvanizers' Association, 34, Berkeley Square, London, W.1, price 25s., post free.

Section 4 of this book covers the preparation of castings for galvanizing, and by strict adherence to the precepts enunciated, friction between the founders and the galvanizers will be minimized. A preference is shown for shot-blasting—though more expensive than pickling—for preparing items for galvanizing, as it can introduce economies. In all there are 12 sections to the book which well cover the whole field; they are written in good plain English which anybody can easily follow to advantage.